Hydrological Chymist:

OR,

A VINDICATION OF *Hydrologia Chymica:*

Being a further Discovery of the **Scarborough Spaw,** And of the right use thereof.

And of the **Sweet Spaw** and **Sulphur-Well** at *Knaresbrough.*

With a brief Account of the **Allom Works** at *Whitby.*

Together with a return to some QUERIES, propounded by the ingenious Dr. *Dan. Foot,* concerning Mineral Waters.

To which is annexed,

An ANSWER to Dr. *Tunstal's* Book, concerning the *Scarbrough SPAW.*

With an Appendix of the Anatomy of the *German-Spaw.*

And, lastly, Observations on the Dissection of a Woman who died of the Jaundice.

All grounded upon Reason and Experiment.

By WILLIAM SIMPSON, Dr. in Physick, and Practitioner at *Wakefield* in Yorkshire.

London, Printed by *J. D.* for *Richard Chiswel,* at the *two Angels* & *Crown* in *Little-Britain,* 1670.

THE EPISTLE TO THE READER.

Impartial candid Reader,

IT is my hap once more to appear in publick, being *neceſſitated* thereto, in vindication of the truth I have aſſerted, touching the *Scarbrough-Spaw*, &c. Were I not conſtrained, and did not the expectation of many

 oblige

oblidge me thereto; I could, I confess, as willingly have laid my *Pen* aside, as have taken it up. At the first glance upon my Antagonist's Book, I thought he had some colour of Authority on his side, but upon second (and therefore more mature) thoughts, unravelling his Clew, I found his quotations of Authors in general, either impertinent, nothing to the purpose in the main, or their sence perverted and wrested, or their words falsly translated out of the Latin. This he, who gives himself the trouble of reading his Book, will find all along, that where he falls short in strength of Argument, he makes supplies in an over measure of Calumnies, Taunts, Scoffs, and groundless Accusations.

Unto

Unto all which ungentile and unſcholar-like uſages, I ſhall only anſwer, by deſiring thee, *Reader*, to conſider, That hereby he hath given me ſo much the advantage over him, that I could not have wiſhed for more or better; for, firſt, I will remarke that his Morals and his Naturals are much of a ſcantling; and it ſeems probable, that he that taught him Phyſicks, read *Ethicks* to him alſo, and his mind (in which they are implanted) is equally productive of both; meaſure one by the other, and they differ not a hairs breadth, and either extends not beyond the dimenſions of vulgar and weak Souls and Intellectuals. Next let it be obſerved, that it is the common guize of perſons leſs fraught with right conceptions of things, to defend

them with disingenuous and discurteous Apologeticks; as we see some soyls that naturally bear unsavory Weeds, will amongst them put forth also Nettles and Thistles, which shall prick and sting the fingers of that Weeder that aims at the improvement of that ground.

Again consider, that thus he hath rendred himself an object of reproof (not to say contempt) and forgiveness; which last I will only take the advantage of, and here publickly give it to him; and though it was *his* business to throw dirt, mine shall be only to wipe it off, and calmly to tell thee (*Reader*) who threw it, and why. I should entertain thy *eye* but courtly enough to repeat his Repartees; suffice it therefore, that I think them no

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worthy a Reply, not that I want ſufficient Arguments, or a competent teſtimony from others to vindicate my ſelf, and invalidate his unjuſt reproaches, but judge it my concern to imploy my time at an other gueſs rate, then to trifle it away with ſuch impertinencies.

His *Epiſtle* goes off at the wrong end; it was aim'd at me that ſtood before it, but like a foul Gun it ſtrikes the Diſcharger; Can you (*Reader*) or I now help it? However I ſhall prompt thee to carry it with thee to the *Spaw*, for there, both that and the whole Book may be of uſe to thee.

I confeſs I could have wiſhed he had uſed his ſilence, not for *my* ſake but his own, for then he might have paſſed for a wiſe man, who now hath told you himſelf what he is; and what

he contains, let this dragm of his *Ethico-Physical* Spirit inform your taste.

But I injure my assertions, demonstrated by Reason and Experiments, (if I overween not) truly sufficient. Therefore, *Reader*, take no notice of immoralities, which, I am sure, were once no Ingredients amongst the rest of the *Spaw*, and their existency therein did appear as little as that of Vitriol; yet (oh the riddle!) I find by experience, after all, that they are therein, for my Antagonist first discovered them there, and of this I yeeld him the glory and tryumph, but whisper to him, it was his own infused addition, and shall (for the Drinker's sake) desire him to throw no more such stuff and filth into those Waters, which God and Nature have intended for other purposes.

There-

Therefore, once for all, I ſhall deſire the Impartial Reader to determine by the eye of his judgment, which Arrow, of the two, ſtick neareſt the mark levelled at, without taking notice which hath the moſt or greateſt Gooſe-feathers in their other ends; and let his Opinion prevail (of us two) who hath wrote moſt truth, and leaſt calumny.

The method that I have obſerved, is, firſt, to clear up thoſe difficulties, and to anſwer the moſt material Objections which my *Antagoniſt* urgeth, and that too as they lay in my way, confirming what I have before ſaid, by undeniable demonſtration, grounded upon Experiments, adding new Obſervations, *pro re nata*.

And for a further diſcovery of the nature of the other Medicinal Waters at *Knarsbrough*; I have given a particular Diſcourſe both of the *Sweet-*

Spaw,

Spaw, and *Sulphur-Water* found there; where I have propounded some Experiments, which not onely demonstrate the Nature and Essence of their constitutive Ingredients, but also by the same may any simple Spring-Water (plentifully to be found any where) be made an artificial Mineral Water, of the same taste and operation with those made by the wonderful Chymistry of Nature in the bowels of the Earth.

The Experiments which concern the *Sulphur-Water*, (& by an analogy) all other the like *Sulphur-Springs*, are such as no Author (which I have yet met with, who write upon those Waters) have taken notice of; which may probably yield no very small light for a further advancement of the knowledge of Sulphurous, and other Mineral Waters.

And

And becauſe the Eſſence of the *Scarbrough Spaw* conſiſts moſtwhat of an Aluminous Salt, therefore I judg'd it neceſſary to give an account of the *Alom-Works* at *Whitby*, deſcribing alſo the difference betwixt the natural and the factitious Alom, comprizing the ſum of the whole matter, upon that Subject, in a few ſhort Corolaries.

When my *Antagoniſt* apprehended that he ran by a wrong byas in his opinion of the exiſtence of Vitriol in the *Scarbrough Spaw*, and that he had ſpent ſo many Pages of his Book to ſo little purpoſe, indeavouring to prove (right or wrong) that to be in the Water, which was ocularly demonſtrated not to be, even before his own face, and in the preſence of ſeveral Phyſitians, Scholars, and other ingenious Gentlemen; and after his laſt refuge to the *ipſe dixit* of Doctor *Tunſtal*, when he had nothing to ſay for

for himself, but that Dr. *Tunstal* told him that Vitriol was in it, last year; was it not a poor (not to say childish) way of Philosophyzing, to ground what a man publisheth to the World upon the bare word (and that but conjectural) of an other man?

Now when my *Antagonist* was thus touched to the quick, he call'd my ingenious Friend (who had made the Experiment before him) aside, and told him, *That if I would then lay down the Cudgels, he would not only look upon me as a Brother, but also, when occasion offered, would sooner take me into consultation then any other.* By which may be concluded one of these two things, *viz.* That either my *Antagonist* has given a wrong Character of me in his Book, drawing my portraiture with as rude, as well as unskilfully handled Pensils, or he is willing to be accounted of as a *Bifrons*, or else be likened

likened to a *Ferry-man*, who looks one way, and rows another; ſpeaks one thing, and thinks another, and writes another.

But after, and notwithſtanding all this, if my *Antagoniſt* ſhall at any time make any Experiments to the purpoſe, and ſhall thence deduce due obſervations, whereby the mechanical part of *Philoſophy* may be improved, I ſhould as willingly receive them from him as from any other; till then I adviſe him to lay aſide his undue and improper contentions, and let us love like Brethren; for I do declare to the World, that I have no enmity to his Perſon, nor hath (what I have done) been, from any particular prejudice to him, but to contend for the truth in things that reſpect my Profeſſion, and the publick good.

I muſt confeſs, that as he has behav'd himſelf as a Magiſterial Brow-

beater

beater of ingenuity, and has indeavoured to eclipse the Light of Truth made forth by Experiments, discovering his darkness and ignorance in the things he treated of; so far, very probably, I have been as a *Remora* to his proceeds; yea, and perhaps, by my means, he has reflected upon his high presumption of infallibly curing Diseases, and knocking them down (to use his own expression) with the great Hammer; whereas indeed the more a Physitian knows, (daily eying the conjectures whereon depends the practice of Physick) the more cautious he is, as to his Prognosticks, and that in respect of the ignorance of the causes of things; and whether such presumptuous Prognosticks, if I should use them, (as my life for his, he shall recover, he is safe; I wish I had a lease of his life, *&c.*) in the management of the cure of Diseases, (when yet, notwithstanding all these, the Patient frequently dies) would not be more an Argument that I am a Quack and Emperick, rather then a sober Physitian, let the Judicious determine.

And now I shall appeal to thee, *(Reader)* whether what I have most-what urg'd, both in my *Hydrol. Chym.* as also in this, do not tend rather to an illustration of Truth, in the

the discoveries of the Nature and Essence of Mineral and Medical Waters, &c. then to any verbal jangling.

Lastly, Because I find not only my Person, and my Apprehensions, but also my Practice under his censure and contempt, all styled by him as Chymical: I cannot decline that none of the smallest measure of generosity I lay claim to, but will now propose to him, (as a final decision of this matter under debate) that we may measure abilities by that unerring Rule, *Dignoscitur Medicus à Medendo.* Let us now (opportunely at this *Spaw*-time) choose by lot such a number (of persons, chronically diseased) not less then twenty, and he of us that shall *citiùs, tutiùs, & jucundiùs,* cure his number, or the greater part thereof, let him win both Field & Spring, and the other depart thence as vanquished either onely for this year, or for ever. Provided, that if the agreement happen to be made only for this year, that the vanquished may enter the next with new recruits, and attempt afresh then, and as often after as he pleaseth; but every time the conquered shall depart for that year.

Pardon me *(Reader)* if herein I seem vain-glorious, I can reflect so upon it as well as another; but I submit to thy judgment,

ment, whether a better expedient can be proposed to confront a man of words, or whether my own just repute *(absit jactantia verbis)* doth require less of me. Or, lastly, whether the matter it self does not naturally lead thereunto. And now to add more words, will ill sute with this effort: Therefore it onely remains that I inform thee, I was willing to fill up some vacant Pages of this Tract, (not then finished) with two particular Anatomies freshly made, the first of the *German Spaw-Water*, usually to be had in *Amsterdam*; the other of a Woman, who recently expired at *Leiden* of the *Yellow-Jaundice*; both not so repleat with inconsiderables, as not to purchase thy favourable acceptance of them, from him, who every way endeavours to exhibit himself

Thine, *W. S.*

Hydro-

Hydrological Essayes:
OR,
A VINDICATION
OF
Hydrologia Chymica:
BEING
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A N I N D I C A T I O N

O F

Mythological Errors:

OR,

A Free Inquiry into the Origin of the Heathen Deities,

And Religious Worship.

Wherein the Doctrine of Divine Inspiration, and the Authority of the Old Testament, are Vindicated, by Reasons drawn from the Principles of Nature.

To which is added,

An Appendix, containing the Sentiments of Dr. Burnet, Mr. Le Clerc, and Mr. Locke, concerning the Book of Genesis.

All grounded upon Reason, and the Light of Nature.

By WILLIAM STUKELEY, LL. D. In Two Volumes.

Printed by J. D. for C. Rivington, at the Bible and Crown in St. Paul's Church-Yard, and J. Darby, at the Black Boy over against St. Dunstan's Church in Fleet-Street.

Hydrological Eſſayes:

OR,

A VINDICATION

OF

Hydrologia Chymica.

THat I may not be too prolix in uſhering in this following Diſcourſe, by any Præliminaries, nor ſeem to make flouriſhes before a paſs; I ſhall therefore (without making him a Leg) forthwith cloſe with my Antagoniſt at down-right Club-Arguments, and my Weapons ſhall be taken up from his own Authors: Yea, I ſhall ſometimes turn his own Artillery upon him, to the wounding of himſelf.

The matter therefore that firſt and mainly offers it ſelf in Controverſie, is this, *(viz.)*

Whether Vitriol or Iron are two diſtinct Ingredients, or conſtitutive Principles of the Scarbrough-Spaw?

Now my Antagoniſt aſſerts, that they are two diſtinct Principles of this *Spaw*: I take it (ſaith he) to be Iron Mineral, with a touch of the Vitriol; or

if you please, *ferrum vitriolatum*, or *vitriolum ferrugineum*: this is a natural Vitriol generated in the Veins of the Earth, through which the Spring runs, which hath by its acidity or esurine Salt actuated the Waters, which thereby is inabled to corrode a Vein of Iron.

By which, I perceive, he looks upon Vitriol as a simple Salt, without any dependance upon any Mineral or Metalline Body: And, as such, hath no relation to Iron, being quite another thing, yet calls it *ferrum vitriolatum*, or *vitriolum ferrugineum*, hooking the Iron to partake of the Vitriol, and the Vitriol of the Iron, and yet are two distinct things. But, I pray you, will not you allow Vitriol, I mean the natural, to be made of the Principles naturally requisite for the concretion and constitution of that mineral Compage called *Vitriol*?

If you do, (as of necessity you must) then if you can demonstrate, by matter of experiment, any natural Vitriol from which by Art I cannot separate a Mineral or Metalline Body; then will I lay down the Cudgels, yea the whole matter, if you please, shall pass upon it.

Doth not *Kircher* expressly say, *Vitriolum vel ex ærata vel ferrata massa suam originem nauciſci*: And further, *Aquam quamcunque acido ſulphuris ſpiritu imbutam æratam glebam exedere; ſeu quidem eſt; corpuſcula ærata ſua edacitate diſſolvere & ſeparare diſſoluta vero corpuſcula prorſus inſenſibili aquam in ſe recipere, iiſque quadantenus miſceri*. Yea and annexeth, *Magnus æs inter & ferrum intercedit magnetiſſimus, inſignique ſympathia ex ſimilitudinem originis pollent, &c.*

Mund. Subter. p. 320.

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From whose words, as also from an experimental Suffrage of Truth, it is clearly evident, That all sorts of Vitriols consist of an acid sulphureous Salt or Spirit, in whose imbraces are alwayes one or other Mineral or Metalline Body couched, which is the main Pillar in the constitution of the Concrete of Vitriol, whether of Iron, Copper or Silver.

For amongst all kinds of Vitriols, whether Natural or Artificial, if thereon (dissolv'd first in Water) a lixiviate Liquor, or volatile urinous Spirit be poured, it doth certainly (as I have further illustrated in my *Hydrol. Chym.*) precipitate the Mineral or Metalline Body therein secretly contained: And therefore such Vitrioline Waters do alwayes, upon the commixture with their contrary Liquors, become so much altered by the loss of their Mineral Bodies, as they are not afterwards capable of altering their Colours, or of becoming an opacous Body of Ink; no nor of ministring their wonted helps for the health of Man's Body: to confirm which, we have given many experiments in our late Treatise.

This Vitriol (saith my Antagonist) is not so properly said to be made by an Esurine Salt, as to have an Enfurine Salt or Spirit in it self: If so, then somewhat else must go to the making up the Compages of Vitriol: and this must be an embryonative mineral Sulphur, whether of Iron or Copper; if of Iron, then it makes the *fontes acidi*, or *vitriolin Spani* frequently to be found in *England*, *Germany*, and other Countries: And those differ amongst themselves according to the disposition of the corroded Vein, or the different impregnation of the Preterlabent Water, with the esurine sulphureous Salt. If of Copper, then it makes the *Vitriolum*

Veneres, or Vitriol of Copper; and that whether it be found dissolv'd in Water, and so boyled up by Fire into the consistence of Vitriol, or it be found spontaniously coagulated within its own Mine, as that called the *Cyprian*, *Hungarian*, *Goslaricke*, &c.

Yet all Artificial Vitriols are made by an imitation of Nature in the production of the natural, as in those that are made out of Copper, witness that which is made by burning of Sulphur upon glowing or melted Copper; from which, with much labour, is prepared a *vitriolin aruugo*, or that which *Paracelsus* commends as the best Artificial Vitriol, being made by a Cementation of Plates of Copper stratified with common Salt and Sulphur: and others after him perform the same by distilling often Spirit of Sulphur or Vitriol from Plates of Copper, until they be black and friable, then dissolv'd in Water, is boyled up, and shoots into a blew Vitriol not unlike the *Cyprian*; So that to the Fabriek of all Vitriols, whether natural or artificial, is required necessarily not only an acid sulphureous Spirit or Salt, but also a Mineral or Metalline Body: And therefore we may certainly conclude that natural Vitriol is, *Partus immaturus Sulphuris Embryonati*, and hath its own mineral and metallick Body in it self.

My Antagonist should have given us a definition of his Vitriol in the *Scarbrough Spaw*. That we might have known what he had meant thereby: he saith indeed, that it is an *Esurine Salt*, which acutates the Waters, (*p.* 6.) which is able to corrode a Vein of Iron; and yet saith, (*p.* 5.) That the Vitriol in the *Spaw*, is not made out of Iron. How to reconcile this contradiction I know not, unless you mean, by Vitriol, a simple Esurine Salt: And

then

then in my judgment you fall far short of expressing the true essence of Vitriol; which is not Vitriol; but as it hath relation to a Mineral or Metalline Body.

For the acute *Helmont* saith, (p. 55.) *Semina salium cuncta in aquis sita sunt, attamen nondum saporem induerunt nisi corporum principia consentanea uterosque terræ debitos repererunt, &c.* (viz.) That all the Seeds of Salts are placed in Water, yet are not indued with taste, unless they find agreeable principles of Bodies, and sutable matrices of the Earth; then, and not till then, they manifest their saltness, and become determined in a saline Body; in one place into Allom, in another in Salmarine, in a third in Nitre, *&c.* To which he adds, *Quocirca notandum, Sal quoddam existere hermaphroditicum metallorum quod defectu nominis esurinum sine acetosum re & nomine vocari capit, generale equidem & ad omnia metalla accommodabile,* (viz.) That there is a certain Hermaphroditical Salt of Metals, which for want of an other name, is called an Esurine or Acid Salt, which is a general sort of Salt, and accommodated to all Metals: So that you see that this Esurine Salt, while such, is no more than Salt, and not a Vitriol; but if it become a Vitriol, it must espouse a Mineral or Metalline Body.

In as much as *Helmont* further saith, *Vitriolum Prestantissimum naturaliter crescit, fodinis, quibus natura istud Sal Esurinum peperit, Venam æris feracem corrodens, & fontis labentis liquore dissolutum,* (viz.) That the best Vitriol is most naturally brought forth in those Mines where Nature hath begot that Esurine Salt, corroding a strong Vein of Copper, becomes dissolv'd in the gliding current of a Spring.

But do not you observe (saith my Antag.) that there is a palpable Pouder, which when a little Gall is put into the Water, (*p.* 8, 90.) by which it turns black, (which Colour it takes from the Vitriol) there will settle, after some hours, upon agitation of the Vessel, a black Pouder near a dragm in a gallon, which hath a stiptick and drying taste like *Crocus Martis*, and after the same manner tingeth the Excrements black.

Very true, I grant that the dissolved *minera* of Iron, or an equivalent *minera* of a strong Concretion, is precipitated either by addition of Galls, or by much agitation, especially in Oaken Vessels, or by long standing, and is that Ingredient in the Water which tingeth the Excrements black. But now look about you; you expresly say, That this precipitated black Pouder hath its colour from the Vitriol, and yet is the Iron Ingredient of the *Spaw*; therefore, according to your own words, it should follow that the Vitriol is yet left behind in the Water: which if so, Why doth it not upon a new addition of Galls, give fresh tincture? Why is it that upon the precipitation of this *Crocus*, by long carriage of the Water, it will give no more tincture by Galls, as we find by experiment.

For I observe that when the *minera* of Iron is separated by precipitation out of the *Spaw* Water, that neither Galls, nor solution of Galls, (either of which would have done before) will cause any alteration, either of Red, Purple, or Black Colour; which it would certainly do if the Vitriol were there, which (according to your own words) gives the colour. So that of necessity, either the Vitriol is not in the Water, or what you speak of it, is not true: chuse whether you please (*Hydroph.*) you are pinch't;

pinch't; and that no Vitriol remains after the falling down of the *minera* of Iron, is apparent; because if you then pour a dissolved lixiviate Salt thereon, instead of precipitating a *terra vitrioli*, (which in all solutions of natural Vitriols will happen) you shall have nothing but a white troubled milkie Liquor: which will in a little time, let fall the several contained fabulous Concretions, which had been dissolved before in the Water, and the Esurine together, with the Nitrous Salt, (which acuated the Water, and made it as a *menstruum*) will be imbrac'd and complicated for the most part with the Lixivial Salts, into a kind of *Tartarum Vitriolatum*: So that by this it's as plain as the Sun at noon day, that there is an inconsistency of Vitriol and Iron, as two distinct Ingredients of the *Spaw*; The presence of which, as two distinct constitutive principles thereof, was what I opposed with sufficient grounds, and now farther confirm, which I think may by as any unprejudiced Reader.

All Authors, (saith my Antagonist) whether Chymists or others, account the Esurine Spirit, or Juyce of Vitriol, enough to impregnate a Water with an acidity, that shall make it corrode other Minerals or Metals by which it passeth; So as we may very well lay aside this Esurine Salt, or *primum ens salinum*, as wholly precarious.

How now (*Hydroph.*) do you accuse me of contradictions, (which I hope e're long I shall take of for the most part) and yet your self guilty of the same, even within the compass of half a dozen lines? Can the Esurine Spirit, or Juyce of Vitriol, impregnate Water as a *menstruum*, and yet the same thing, (*viz.*) the Esurine Salt (for by Esurine Spirit, Esurine Salt, or *primum ens salinum*, the same

is

is understood) be wholly precarious? how doth this hang together?

I perceive you have imbib'd but a very sleight touch of *Helmont*, otherwise you would have been better impregnated with his Principles, than to have denyed the same thing you had before owned in a very little different expression.

Do not you frequently mention the Esurine Salt, *p.* 5, 6, 7, 17. (*viz.*) That by its Esurine Salt, (speaking of the *Spaw*) it more freely corrodes the Iron, and that Vitriol hath an Esurine Salt or Spirit in it self? and yet here you say, It may be laid aside as wholly precarious; this is *quidlibet ex quolibet* justly retorted. But why do I trouble my self, these are only sudden flashes of your *ignis fatuus*, soon in and soon out, apt to lead the timerous and unwary aside.

But pray, if Iron be in this *Spaw*, as a distinct Ingredient thereof from Vitriol, What is that which is the *menstruum* in the Water, to dissolve Iron, (*viz.*) to make it appear in the form of a Liquor?

I tell you (saith he) what will do it, besides the Alkahest of the Chymist; Vitriol imbib'd at the first, doth by its Esurine Salt make the Water corrosive, and fit to take that or any other Mineral that is in its way: Well, this is a confirmation of your late Contradiction, yet you hover and endeavour to gain the Forts you formerly quitted; for first you own an Esurine Salt, *p.* 5, 6, 7. and then *p.* 11. you lay it aside as wholly precarious; and here, (*p.* 17.) you very fairly take it up again; and *p.* 96. you say, you have with good reason exploded *Helmonts primum ens*.

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I'le refer you (saith my Antagonist) to your grand Master *Paracelsus*, where treating of Acid Waters, *Harum ortus est (inquit) ex resolutione Metallorum, antequam ad maturitatem pervenerint*; And presently after saith, *Interdum ex vitriolo & a lumine hujusmodi aquæ promanant*.

You are mistaken, (Sir) I pretend not to be a Paracelsian in Physiology, not much valuing his Theory; your self quote him five times, I may say, I think for my once; what I esteem him for, was his *Medicinal Arcana's*; by which he was enabled to perform great Cures, maugre yours and others malice against him, and other searchers of Nature. As to that first sentence you urge, if you consult a little further, you will find he saith, *Aurum & plumbum dant dulcedinem, cuprum ferrumque aciditatem*: Now as for Gold, that will give no Vitriol; and for Lead, that requires an Acid Salt, either Vegetable or Mineral to make a Saccharine Vitriol thereof; and Copper or Iron, with an additional *Aereal* or Mineral Acid Salt, gives in a Water Spring an acidity; that is in short, makes a Vitriol either of Iron or Copper.

But to proceed, There are four wayes (saith my Antagonist, *p.* 21.) whereby Water may imbibe the Nature or Vertue of a Mineral or Metal.

The first is, By receiving its Vapour; thus Water standing some while in a Brass or Iron Vessel, will taste of the Brass or Iron.

Not to say (*Hydroph.*) that those four wayes of imbibitions you reckon, are pillag'd out of Doctor *French* his Book of *Knaresbrough Spaw*, and out of *Falopius*, *cap.* 8. without taking notice of the Authors, is a crime you can indulge your self and not another.

Fal.

Falopius tells us in that place, where he speaks of the several commixtures of Minerals and Metals in Water, *Omnes mixtiones pendent a triplici causa, Scilicet a calore, a mora & ab aptitudine materiæ ad Eliquationem.* The last of which insinuates an aptitude of the Solvent, solvable or both. *Non solum* (he goes on) *telluris species, sed & vapores, & succi, & metalla, in subterraneis cavernis reperiuntur*, &c. Amongst those he calls *succi*, he reckons the Mineral Salts; which (as *Basilius Valentinus*, who was much conversant amongst Minerals and Metals, saith) are the Keys to unlock the Mineral Kingdom, and that whether naturally in the Bowels of the Earth, or artificially upon solid Minerals or Metals: and amongst the *succi* Minerales, *Falopius* reckons the *succus Calcanthi*, which whether ever it fell in his or some others way that treat curiously thereof, to anatomize that Mineral, so as to rightly understand its constitutive Ingredients, may be much scrupled.

But to return to your Vapours, *Falopius* saith, *p.* 25. That they are all either *maligni* or *benigni*; the malign we will pass, and come to the benign, for those (if any) I hope, breath upon our Spring; These, he saith, are either *bituminous* or *sulphureous*. *Ego (inquit*, speaking of the Vapours) *non reperi aliud, non reperiri dico nec scriptum nec experientia*, &c. So that although you say he useth the tearm above forty times in the sense you speak of, even in one leaf side, yet do I not find a word in that place, either that Vitriol communicates it self to Water by a Vapour, or that Iron or Brass will give a Vapour to Water which stands therein: And yet you say he speaks of Vapours in your sence; if he do, it is indeed so in your sence, but I know not that it is in any others: And that I may be very brief,

brief, I refer the intelligent Reader to compare what I have writ hereof in p. 6, 7, 8, 9, 10. of my *Hydrologia Chymica*, with what my Antagonist asserts in his three Books, for I love not repetitions: I confess he saith, *Aqua Calcanthosa cognoscitur gustu & olfactu.* But that those Vitrioline Waters should chiefly (or eminently, as your own words are) partake of Vitriol by its Vapour; is what I do not find him mention, nor do I understand. It's probable indeed that there are Vapours, but those arise from a fermentation amongst the Mineral Juyces, and are themselves scarce sufficient to make up any one Mineral Body, so as to become the efficient of any Acid Water or *Spaw*.

But to proceed, (*p.* 28.) Doth not Iron (in effect urgeth my Antagonist) give it self by a Vapour to the Water? for the Iron that is imbib'd in this Spring, is not a solid or compact body of Iron, but like an ordinary Earth impregnate with a concrete Juyce of Iron.

To which I answer, That though we suppose Iron in those mineral solutions, to be in its juyce or succulent parts; yet do not you explain an agent capable of making this Iron spend it self in Vapours? and since these Vapours must either be corporeal or incorporeal; the last, I hope, you will not grant; if therefore they be corporeal, then these Vapours must of necessity have the essential parts of Iron in them, (*viz.*) the Mercury and the Sulphur proper thereto: If so, then what difference is there betwixt these Vapours, or minute parts of Iron congregated, and the body of Iron it self? for seeing it is (as I further inlarge in my *Hydrolog. Chym.*) the union of the Mercury and Sulphur in various degrees, according to the model of the Metalline

talline Seeds, which gives the essence, yea and distinction of Metals amongst themselves. Therefore that which must be the agent or efficient to make a Metal (*viz.* that hath Metalline Principles, though not throughly maturated) to vapour, must be amongst Fire or Ferments, Salts or Solvents: For in Nature (as far as I can apprehend) there are found no other material Agents than what are comprised in those four.

Now it would have very much establisht your Hypothesis of Iron, communicating it self to the *Spaw* by a Vapour; if you had assign'd the Agent, by which the Metalline Body should spend it self in a Vapour.

Well, (quoth my Antagonist, *p.* 29.) consult *Kircher*, and he'l tell you that Iron yeelds a Vapour to the purpose, *Observantur* (*inquit*, *Lib.* 10. *Cap.* 10. *p.* 219.) *in fornacibus*, *&c.* To wit, In the Iron works, where it is melted, Vapours arise out of the Iron which turn into a downiness, which cleaves to the Walls and Roofs of the House: He also saith, That of all Metals, Iron sends out the most fœtid smell.

Here is indeed an Agent (*Hydroph.*) with a witness, (*viz.*) The fire of a Forge, which must needs make Iron, as well as all other imperfect Metals, take Wing, and make the next adjacent places their Receivers; the same doth Lead, witness Potters Houses, where they calcine their Lead to Pouder, by frequent agitation upon the fire, where the flowers of Lead are seen to hang round the Roof; so Tin, yea Copper will do the same, witness the *flos æris* in the melting Forges, *&c.*

But what *Æquipollent* Fire will you suppose to be near the *Scarbrough Spaw*? Perhaps you may think

think *Vulcan's* Forge is near hand, and that the Vapours of calcined Iron are driven into this Spring, and so are somewhat akin to the late Eruptions of Mount *Ætna*: I confess indeed that Iron and Copper, *&c.* will not only contract an *Ærugo* by an Acid Salt or Spirit, which floats in the Air, and so waste themselves away in Vitriols, but also are subject to the same fate of all other mixt Bodies, (*viz.*) to suffer some parts constantly (though insensibly) to wind off, and so wear away in a tabidness incident to all Elementary Bodies; while some parts, by other active Principles, are wheeled off, and by different Seeds are determined into (and wound on) other bodies; and so in a round, in the Metastasis of bodies, from one form into another, through the whole Fabrick of the Creation, and that in a perpetual vicissitude; and unless you will take this constant unhinging the particles of Concretes to be Vapours, I know not how you can possibly make good your assertion of the Vapours of Iron communicable to the *Spaw*.

Do not Metals (saith my Antagonist) yeeld an *Apporrhea* while they are firm? Have you never seen a wise man (for you have lost your smell) put a counterfeit Coin to his nose, and aver that it smelt of Copper? The like may be said of Iron and Brass, and yet you say the compact body of Iron will not impart a Vapour to a Liquor; wherein the Apothecaries Boys will laugh at you, when we prescribe Chalybeate Drinks, which is ordinary to Hypochondriack Maladies; the Liquors receive a Vapour from the Iron, and yet the compact body of Iron still remains.

Metals do indeed yeeld an *Apporrhea* in that sence I have lately discourst on, (*viz.*) by a continual

tual winding of, or wearing away of the parts of the Bodies, some sooner, some later, and that by the efficiency of active principles alwayes in motion, and so all bodies are subject thereto, more or less, and so you may as well say Gold, Marble, &c. have Vapours; seeing these also escape not in some measure the general mutability of mixt bodies; besides there are many Concretes which have no smell, and consequently no Vapour, (according to the acceptation of the word) and yet are subject to the common vicissitude of Bodies.

As to the discovering of counterfeit Coyn by smelling at ones Nose; in the alleadging of which, I perceive you were not very cautious, for Copper is a Metal that doth easily contract an *Ærugo*, or *flos æris*, by the acid menstrual Salt in the Air, (which whether the Solution thereof be facilitated by the Conuate Esurine Salt, (peculiarly natural to Copper or Iron, as Dr. *French* would affirm, is not much necessary now to determine) and so what taste or smell it hath in coyn'd pieces, or otherwise, is to be ascribed to its Vitriol, and not to the body of Copper: We see where ever Copper or Brass is, whether aloyd with other Metals, (so as it out-proportions the united Metal) or alone, is very apt (unless constantly kept dresst and clean) to gather greenish Rust, which is nothing else but a Vitriol thereof, and this (and not the Metal singly) is that which both gives the taste and smell, both to Liquors that stand long, or are boyled in such Vessels, or to coyn'd pieces: And therefore *Paracelsus*, and others, together with your self, not well weighing this considerable circumstance, might easily be deceived, and suppose the bodies of those two Metals, (when it was nothing but the Vitriols thereof)

to

to give that taſte & ſmell which is ſometimes found; and therefore the inſtance (my Antagoniſt) then brings to confirm that emiſſion of Vapours from Copper, (*p.* 25.) by putting Carps into a Copper Brewing-Veſſel, with freſh Water, to be preſerv'd for one night, were all found dead in the morning, is, I ſay, invalid; and that firſt, becauſe the Copper Veſſel (for ought you know) had not been uſed lately before, and perhaps was not carefully cleans'd, and thereby might (as we have ſhewed before) eaſily gather a greeniſh ruſtineſs or Vitriol, which by the pouring Water therein, might eaſily diſſolve, and as readily kill the Carps, as if ſo much other natural or artificial Vitriol had been put therein; next to which, the change of the Water, which might very likely have a touch of ſome Salt (that, many times is not eaſily diſcoverable) might prove altogether diſagreeable to the Fiſh. Whether way we take it, you ſee there is no need to aſcribe it, or juſtly think it aſcribable to the Vapours of the Copper: Which ſuppoſe we ſhould grant, how abſurd and incongruous to our health would it be, to ſup our Broth, eat our Meat, and drink our Drink, ſo conſtantly made ready by thoſe veſſels, whoſe ſteams were able to kill Fiſh? Would it be at all ſafe to prepare our ordinary Food in ſuch Veſſels as have ſuch poyſonous Vapours?

Yea, and that I might confirm what I ſay by matter of fact, I procured ſeven or eight ſmall Fiſh taken in a Net in *Colder*, which I ordered to be carried to my Houſe in ſome of the Water they were taken in, which with more of the ſame Water I put into a bright clean ſcoured braſs brewing Pan, which cauſed to be ſet into the open Air, (for probably want of freſh Air might amongſt other things, not a

little contribute to the destruction of the Fish) and found them not only to be alive the morning following, but to be as lively and brisk in their motions, as when newly put in; where for tryal sake, I kept them another night, and found them the morning after, in a manner as brisk and active as at the first.

And whereas, I say, that all compact Metalline Bodies must have proper and peculiar Menstruums to unlock them, if any Medicinal Arcanum be thence expected. My Antagonist answers, p. 25. Why! I can assure him upon tryal, that the filings of Steel (suppose a pound) set to infuse in a quart of clear Spring Water for a few dayes, the Water upon evaporation afforded a clear Salt of greenish colour.

To which I return, That it is my Antagonist hap to be very unfortunate in the proposal of his Experiments, and therefore should not be one intrusted to make those Experiments from whence a well grounded Hypothesis of natural Philosophy should be deduced; for he is unwary, in the due poysing of those concomitant circumstances which make Experiments critical, and from whose management depends the successfulness, or the contrary, of most Experiments. For had he rightly considered that all or most Spring Waters we meet with, have a sleight touch of some one or other Mineral Salt or Earth, which is that which gives the difference to tasts Spring Waters have one from another, (distinguishable by curious Palates accustomed to drink Water) he would not have made use of that as his Menstruum, for the tryal of extracting a Vitriol Salt out of Iron.

I did indeed try the like Experiment with Spri

Spring Water which we have by us, poured upon clean filings of Steel, (for that's another circumstance which unheeded may also make his Experiment, as to what is intended, thereby miscarry) which being decanted (after it had stood some dayes) and evaporated, gave (as my Antagonist saith) a greenish coloured Salt: which had I not been further inquisitive in weighing the circumstances better, I had concluded, with my Antagonist, that it had been a Salt from the Iron: but I considered whether or no indeed this Spring Water might not contain in its self this sort of Salt, which upon tryal (by evaporating it away alone in a Jar Glass) I found that it left the very same sort of Salt, and as near as could be esteemed, the like quantity with that left after the infusion of the Water upon the Iron.

Therefore, for further satisfaction, I poured some distilled Water upon filings of Steel; which being poured off, after several dayes infusion, found no such Salt at all left behind. nothing being left in the bottom that had any Salt: by which I have clearly demonstrated how easily (for want of due circumspection in circumstances essential to things to be tryed by matter of fact) my Antagonist can impose upon himself and others by fallacious Experiments.

And as to what you say, that the Apothecaries eyes would laugh at me for denying Iron (as a impact body) to impart a vapour to a Liquor; I might tell you, that if I could spare so much vacant time, I could both laugh at you and them; at you first, and chiefly for your ignorance of the very nature of the Metals you treat of, supposing Chalybeat drinks (frequently ordered for Hypochondriack Malladies) to be made after such a manner as wherein the

Iron gives it self by a Vapour to the Liquor, not Un-
derstanding (at least not recollecting) that to mak
Chalybeat Waters, they most frequently (if no
alwayes) add some Saline or Acid Spirit, to mak
the Iron capable of being dissolved in part in th
affus'd Liquor, and that either by taking the Cro
cus, or other preparation of Iron, wherewith t
sariate their Liquors, which become so much dif
soluble as to give them the name of Chalybeat Wa
ters or Liquors.

For in all Chalybeat Extractions, you shoul
not (*Hydroph.*) be ignorant that there is require
either that the Iron be reduc'd into a Crocus, whi
is done either by Calcination, (and that either p
se, or with Sulphur) or by Acid Spirits, such
distilled Vinegar, Spirit of Salt, Niter, Sulphur, &
or else that the Menstruum to be affus'd, have so
innate acidity.

I would gladly know (*Hydroph.*) whether yo
ever order your merry Apothecaries Boyes to ma
you any Chalybeat Liquors, by barely pouring si
ple distilled Water upon fresh filings of Steel, a
whether they or your Patients do ever discern a
taste or smell of Iron from such Waters? Doth n
I pray, the main reason of Chalybeat Extractio
depend upon the reduction of Iron into a Croc
or the acuation of Menstruums by Saline Spirits,
either of which there happens a solution of som
the body of Iron into the Chalybeat Liquors, wh
give them a sapor not a vapour? It's true, if you
rusty filings of Iron, Water upon its affusion
thereby have an Iron taste; but this is by reaso
an acid Salt in the Air which hath fretted the B
and turned it into a Crocus of Iron, and the
makes it yeeld a solution of some of its parts.

And now (*Hydroph.*) by this time, I think you and your Apothecaries Boyes have done laughing, and may take time to turn your Vapours into Tears, and ſpend them at your leaſure.

Doth not *Falopius*, *p.* 29, 34. (who had great experience in Mineral and Metalline Waters) ſay, *Arbitror non reperiri aquam ferream*; for certainly if Iron would give it ſelf immediately to Water, then ſhould we find frequently thoſe *aqua ferrea*, in places where Waters run through the *minera* thereof: but no ſuch by experience are found, therefore our Argument will be ſtrongly inforc'd, *a majore ad minorem*, (*viz.*) that if in the *minera*, where the parts are more looſe, it will not yeeld its Vapour or Tincture to Water, much leſs will the compact Body thereof, (which hath undergone the violence of the melting Forge) do any ſuch thing.

And whereas you cavel at my Philoſophical Deſcription of Ink made forth by Colateral Experiments of the *Spaw*, if you could have carpt at any thing therein, no queſtion but you would; or if you had given a better, then you had done like an Artiſt, and ſo might have paſſed it over with a joke: for though the Subjects ſometimes we treat of be but common obvious things, yet they require a ſearching diligence and deep diving, Philoſophically to ſolve the abſtruſities of the nice Compoſitions and Commixtures of Bodies, to make their *Phænomena* obvious.

I pray, (ſaith my Antagoniſt, *p.* 35, 36.) Are Iron and Vitriol all one? I think they do as really differ as your Knife and your Ink. Do not all Authors, as well Chymical as others, that treat of them, do it ſeverally? And doth not *Paracelſus* ſay, *Natura generat ſalem vitriolum dictum*, &c. Do not

Galen, Mathiolus, Sennertus, Pliny, Renodeus, speak to the same purpose?

To which I answer, That Iron and Vitriol may indeed be two distinct things, but then the Vitriol must be such as is made out of some other Metal or Mineral: but if you query concerning natural acid Salt & Iron, as coexistent in the same Concrete, then I say they are both one, (*viz.*) they both together make up that Concrete we call Vitriol; from which if you separate the Iron, what remains falls short of being a Vitriol, and becomes only a Salt, which is more simple than Vitriol, as being indeed but one Ingredient thereof. And out of such a Vitriol or Iron, if you be a good Metallurgist, and skilful Mechanick, you may make as good a Blade as you have a Haft; for, as to what you urge, how that those Authors speak in confirmation of your supposition, I am not much sollicitous, especially if what they write come in competition with truth, as it results from matter of fact; besides some of these Authors, (as they have occasion) treat severally of these Concrets as different Subjects, and not as they bear any relation to each other in Mineral Solutions and Concretions, and so indeed they are different, and may be discoursed of as differently.

And as to what you repeat out of *Paracelsus*, I am not concern'd, seeing he doth not confirm it by matter of fact, nor by any evident demonstration. I find *Paracelsus* very incautious in his assertions, and as for true Physiology not much to be regarded; besides, what he there saith doth diametrically oppose what may be made evident by Experiment; for he calls that a Salt, which after separation of other Ingredients, is yet reducible into a more simple Salt, witness the Salt of Vitriols which

is separable out of any natural Vitriol, after the separation of the Mineral or Metalline parts.

Yea, I will tell you, (*Hydroph.*) that if you can produce out of any of the aforesaid Authors, so much experiment as to make evident, by matter of fact, what you would prove; yea, if you can shew me from any ingenious Chymical Artist (to whom you must be beholden, if ever it be done) such a Vitriol either extracted from this *Spaw* or elsewhere, that is such a simple Salt as from which I cannot separate a Mineral or Metalline Body; or if you can separate a Vitriol out of the *Spaw*, after the precipitation of the *minera* of Iron, The Game I assure you shall be upon your side.

For where you instance what I say *p.* 47. of my *Hydrol. Chym.* in *p.* 105. of your Mimick, (*viz.*) that I arguing against Vitriol, as being inconsistent with that of Iron in the *Spaw*; the reason you blush not to urge, why though Vitriol be in the Water, yet it should not vomit, was that we used it (said you) in Juleps and Cordials, which doth not cause Vomiting; which you confirm and say, That the main part of the Vitriol in this Water is the Spirit; which is as much, yea far more diluted with the Water wherein it is, than the force of the Vitriol is corrected by the vehement heat of the fire in the distilling of the Spirit thereof.

Now to come to the point, (*Hydroph.*) if it were certainly true what you say, that the main part of the Vitriol in the Water is the Spirit, then it would without controversie demonstrate it self by distillation: For seeing, according to your own supposition, the Vitriol is in Spirits in the Water, and these Spirits are also very subtile, volatile, and penetrative; therefore of necessity, upon distillation of these

Waters fresh from the Spring, these Spirits should arise first; but that they do not, I can assure you, by matter of Experiment; for I distilled some fresh Water from the Fountain in a Glass Retort, at *Scarbrough*, whose joynts was exactly closed up; I sav'd the first half ounce, yea and in another distillation of fresh Water, the first quarter of an ounce of Water which came over, (supposing that if any volatile, vitrioline Spirits would come, it would be at the very first) whose taste or smell did not (I affirm) at all resemble the Spirits of Vitriol, which according to your Hypothesis they should have done.

But suppose that what had come off at the first, had been of the nature of vitrioline Spirits, and had, by the sharpness of their taste, and sulphureousness of their odour, demonstrated themselves to have been such, (which yet I assure you hapned to the contrary) yet would it not thence have followed that these had been Vitriol, as you assert, for it is (if I mistake not) beyond the bounds of Art and Nature, to make Vitriol out of these Spirits alone; these Spirits indeed may (as I have sometimes seen) be coagulated into a solid dry Salt; but yet is this Salt as far removed from the Essence of Vitriol, as it was, while liquid, and in the form of Spirits: Now that Vitriol should yeeld it self by Spirits, and these Spirits impregnate the *Spaw*, and yet upon the test to be found to be no such things, argues a fiction from the beginning to the end.

But if you further urge and say, (as I find you do, *p.* 104.) that these Spirits are so penetrative, as that they can even pass through the Glass and Lute; then you must erect a new Classis of Spirits, such as never yet have been found *in rerum naturâ*: For we find that the volatile and most subtil Spirits of

Harts-

Harts-Horn, Urine, Blood; yea, and of *Sal Armoniack* (then which nothing is more penetrative) may be catched in Receivers; (yea, even in such as I us'd for the taking these supposed Spirits of Vitriol) and may be kept a considerable time in Vials, close stopt, even for a year or more, as I have done, without any great loss of their volatile parts.

These Spirits, I say, may be received and kept, and yet are the most penetrative of all sorts of Spirits we meet with in Nature, save the *flatus incoercibilis*, or *spiritus sylvestris*, which is the common sequel of Fermentations; whether of Minerals, whence proceeds the incoercibleness of the *pulvis pyrius*, *aurum fulminans*, &c. Yea, and whence all sulphureous arsenical and malignant damps, or whether of Vegetables, witness the *flatus* from the fermentation of all potable Liquors, *&c.* Or lastly, of Animals, from the spurious fermentation of whose Juyces, proceed a *flatus incoercibilis*, the very efficient and agent in Paralytick, Apoplectick, Epileptick, Asthmatick, Hysterick, and other Diseases, as you may further see in our *Hydrologia Chymica.*

As to what you say, that Dr. *Heers* in his *Spadacrene* saith, That the *German Spaws* consist of Iron, Vitriol, and Ochre, thereby making Iron and Vitriol distinct: if you consult what I say thereof in *p.* 138, 139. of my *Hydrol. Chym.* you may find a sufficient resolve thereof, which I shall not now repeat.

Fallopius (saith my Antaguniſt) treating of the *Spaw* in *Germany*, and that at *Rome*, saith, *Arbitror eas e[illegible] habeant calcanthum purissimum.*

I grant indeed that all Acid Waters are chiefly from Vitriol; but then that Vitriol must have annexed to it the mineral compage of Iron or Copper, or what third you please, yea, and is not factitious neither, but natural; for *Scroderus* (which Author you also quote) saith plainly, *Varia sunt genera Vitrioli, pro naturâ mineræ quam in se continent differentia*, (as you may see, p. 414. of his *Pharmach.*) But that *Scarbrough Spaw* Water is as a Vitrioline Acidity, is *petitio principii*, as I shall afterwards make more evident.

Another token of Vitriol, (saith he) is that *Apporrhea Mineralis*, or Vitrioline Vapour, which any of an indifferent smell may observe, which is somewhat like that of Ink, though more pure.

Indeed (*Hydroph.*) when I was last at the *Spaw*, I tryed several times if I could any way be sensible of that Vapour; but neither I, nor two Physicians more that were by, could at all perceive it: but perhaps we had by consent got cold, and were obstructed in our Nostrils, so as we could not as well perceive that *apporrhea* as *Hydroph.* Nor do I discover any thing of Vitriol, either as to the Juyce thereof, or *apporrhea*; which afterwards I shall make good by ocular demonstration.

But looking back (*Hydroph.*) to *p.* 13. of your *Mimick*, I espie you impeaching me of a contradiction, in that I asserted, that an aluminous Salt, from a mineral acidity, had dissolv'd a slight touch of the mineral of Iron, *&c.* Are not here (saith *Hydroph.*) two Minerals made, (*viz.*) Iron and Alom by his own confession? To which, I answer, that it's graunted. Nay further (saith *Hydroph.*) I'le see if I cannot find two more, look (*p.* 359.)

and

and there he saith, upon a further tryal of the *Spaw* Water, he found a body of Vitriol, which he calls *Terra Vitrioli*; then turn over leaf to (*p.* 360.) and he tells you he found Nitre.

To which I return, That as to that which I call *terra vitrioli*, I understand no other then that *Crocus Martis*, or *ramenta ferrea*, or *terra rubrica*, or *minera ferri*; all which are synonymous, signifying the same thing, (*viz.*) the mineral or metalline Ingredient dissolv'd by the Esurine sulphureous Spirit in Vitrioline *Spaws*, or by the *nitro* aluminous Salt, in *nitro* aluminous *Spaws*, such as *Scarbrough Spaw*. So as you are mistaken (*Hydroph.*) to think that I intend by *terra vitrioli*, any other Ingredient then the *minera ferri*; wherefore all rightly weighed, you find me but to number up (besides the several fabulous Concretions) three mineral Ingredients of that *Spaw* (*viz.*) Alom, Nitre, and the *ramenta ferrea*; and those are demonstrably apparent, as elsewhere I may take time further to enlarge upon.

But now (*Hydroph.*) that I may not be long in your debt, but may retaliate *in specie*, I find, as I pass along, that you say, (*p.* 7.) The Iron is not here (speaking of the *Spaw*) a perfect solid Metal, but *in solutis principiis*. And (*p.* 44.) you say, That Iron is here in its body, which being calcin'd, yeelds a *scoria* like Iron: And yet you say, (*p.* 80.) That the Salt got out of Iron by burning it with a Candle, infusing it in Water or Wine, this is the Ingredient in our Water.

How will these hang together (*Hydroph.*) that Iron in the *Spaw* should not be a solid Metal, and yet should be here in its body, yea and not in his body? for you say, The Salt got out of the Iron, (while

(while the Astringent *Crocus* remains) is
pag. 7. that which opens Obstructions, and is the
pag. 44. Ingredient of our Water; so that it's
pag. 80. this Salt, (it seems, according to those last words) and not the body of the Iron, which is the Ingredient of the *Spaw*; which how contradictory they be, let the impartial Reader judge.

Also, you say, in the calcination of the
pag. 67. Minerals of the *Spaw*, That though they calcine whitish, yet there are (here and there) *Laminæ ferreæ*, or flakes of Iron interspersed, broad and thin like those that fly off from Iron while under the Smith's Hammer; and yet you query, (*p.* 65.) Why we should expect that the Minerals should calcine in *Scorias & Crocos*, since we had not here to do with perfect Metals or Minerals dissolv'd in Water? for you acknowledge that there are *Laminæ ferreæ*, which you expressly (*p.* 67.) call the *scoria* of Iron; and yet you ask, why we should expect these Metals or Minerals should calcine *in Scorias & Crocos?*

Again (*p.* 65.) you instance *Snelfer*, (*viz.*) That the firm Metals being calcin'd with violent fire, (among which he reckons Iron) will not calcine into a Pouder, out of which Salt may be extracted. But *in scorias & Crocos convertuntur nentiquam in cineres quibus verum Sal elicienᵈ.* Thus far you have from *Snelfer*; here you stay not, but you borrow anothers Weapons, and forthwith become lyable to have them turn'd upon your self; for presently you pass into tearms expressly contradictory to what you bring him in to vindicate. Your words run thus, Now if so (quoth *Hydroph.*) why then should these men expect that these Minerals should calcine

calcine *in scoriis & Crocos.* And (*p.* 67.) speaking of Iron precipitated, This (say you) I calcin'd in a Crucible, in a very strong fire, and it became of a dark brown colour, and turns to a gross Pouder hard as a Cinder, and is no other than the *Scoria* of Iron: After calcination, I dissolv'd and evaporated it, it afforded a browniſh flosçule, very sharp and biting upon the tongue.

Now (*Hydroph.*) pray you obſerve the plainness of the contradiction; for first you produce *Snelfer*, urging that Iron will not calcine into a Pouder, out of which Salt may be extracted; and yet you say, you calcined the precipitated Iron of the *Spaw* with a strong fire, and it turned to a gross Pouder as hard as a Cinder; out of which, by solution and evaporation, you can get a browniſh flosçule, very sharp and biting; which you confeſs to be a Salt, first by saying, *p.* 67. that the Water where the solution is made, is brackiſh; next to which you expreſly call it a Salt, saying, The Liquor will have a strong taſte from the Salt, which opens Obſtructions, and is the Ingredient in our Water: So that being incautious of what you lately urg'd out of this Author, and being byas'd by collateral experiments, you preſently even unwarily fall foul upon the very Author you even now quoted, by contradicting thoſe very words you expos'd for the vindicating your own aſſertions. And whereas you urge the same Authors words, (*viz.*) *Sed in Scoriis & Crocos convertuntur*; if you proceed you will find him to continue on with theſe words, *Qui Croci tamen nil niſi Scoriæ ſunt, in minutiſſimas atomos converſæ, & veluti in terram mortuam inſipidam, è quibus Sal aquâ affuſâ elici nequeat:* For the scope of this Author in that place is to anſwer theſe three conſiderable Queries.

The

The first, *Whether any Metal may be truly calcined and brought into real Ashes, from which a Salt may be extracted?* which in his Discourse he determines in the Negative.

Secondly, *Whether an extraction of the same Sugar or Salt of Lead, (and consequently of Vitriol, &c.) be a true extraction, or only a solution?* the latter of which he affirms demonstrably.

The third and last, *Whether this or any other Salt or solution may be edulcorated by solution, filtration, and evaporation?* which he denies evidently.

Now as to the first, He denies that any Metal may by force of fire be reduced *in Scorias & Crocos, vel Cineres*, from whence any Salt may be extracted; and yet you say, (*Hydroph.* p. 79.) That the deopilative property of Iron lies in a Volatile Salt, with which it abounds; which you say you can extract, and is the Ingredient in the Water; so that it seems it's the Volatile Salt of Iron, and not the body of Iron is the Ingredient of the *Spaw*. Surely (*Hydroph.*) if there were a Salt in Iron, yea, and that Salt volatile too, (as your own words express) why should not it have taken wing by force of fire at the melting Forge, where the Iron is melted and separated from its drossie earth; by which I conclude you were more taken with the neatness and novelty of the word Volatile Salt, then with the truth of what should be intimated thereby; but your Tyrociny in these abstruse studies plead your excuse; yea, the rawness, or rather lightness of your experiment, (*p.* 80.) doth upon that account call for some more grains of allowance, where you say, That if filings of Iron and Steel be cast into a flame of a Candle, that they burn like Salt-Peter or Rosin, which you suppose to happen from the volatile

tile Salt, as if that gave the flamability; whereas amongſt the whole Claſſis of ſimple volatile Salts, there are none found to be flamable; ſimple, I ſaid, becauſe in the complication of theſe, with other volatile Spirits, ſomewhat ſulphurous may ariſe, as that of the *Offa* made with other volatile Spirits of Urine, &c. with Spirit of Wine; for it is the eſſential property of ſulphureous Spirits or Bodies to take flame and burn, but not of volatile Salts; and that it is ſo, appears further, in that we have ſometime extracted out of Iron, Aqua Fortis, or Spirit of Vitriol, a combuſtable Sulphur.

But to paſs to your third Argument, Why Vitriol (as you ſay) muſt be in the *Spaw*, and that is by reaſon of the deep tincture that the Water takes from the Gall, more then any other you have ſeen or read of, which cannot (you ſay) come from the Alom.

To which I anſwer, That if we can demonſtrate by matter of fact that Alom will give this tincture, and that whether calcin'd or crude, then muſt this your great Argument fall; but both my ſelf, and my ingenious Friend, have demonſtrated before you and the Gentlemen at the *Spaw*, at ſeveral times, that both will readily give a Purple tincture (being diſſolv'd in freſh Water) with the addition of Gall; yea, and will both undergoe the ſame mutations of colour with that of the *Spaw*, by the addition of the like Spirits and Liquors; as I have in my Book already, and I may afterwards take occaſion further to illuſtrate.

Your laſt Argument is aſſumed from a vitrioline Salt which (you ſay) ſweats out of the Cliff, of a dark yellow colour, very ſharp to the taſte, even far beyond Nitre or Alom. My anſwer is, That

you

you have no ground to ſuſpect that dark yellow coloured Salt to be Vitriol, ſeeing there are no vitrioline Marcaſities to be found all along that Cliff where that Earth or Salt is found; for I have with much diligence ſearched the Bank, but could find no vitrioline Stones at all: And ſeeing (as you may further ſee in our *Hydrol. Chym.*) that all Salts reſide in their own proper and peculiar mineral Beds, *Utpote in toris ſuis mineralibus*; Therefore where Vitriol Stones are found, Vitriol is made: And where the Alom Glebe is found, Alom is made. Now where both Minerals are found, there is both Vitriol and Alom; as I have ſometimes ſeen in a parcel of common Vitriol, where the natural Alom hath alſo been intermixed, being ſhot forth in white Chryſtals amongſt the green Cubick Chryſtals of the Vitriol. So that Vitriol is never made out of the Alom Stone, nor Alom out of the Vitriol Marcaſite, but each are got diſtinctly out of their own Mineral Glebes; otherwiſe the Vitriol and Alom workers would be groſly miſtaken, (*viz.*) if the Alom-worker ſhould out of Alom Stones make Vitriol, and the Vitriol-worker out of Vitriol Stones ſhould make Alom. Beſides, a ſolution of this yellow Earth or Salt will by Filtration and Evaporation, perfectly become a mineral aluminous Salt, as you may ſee in my *Hydrol. Chym.* which yellow Salt will alſo undergoe all the mutations of colours equally with the *Spaw*.

As to what you ſay, (*Hydroph. p.*45.) That the Cliff out of which this Spring flows, is plainly Iron, is ſurely a very groſs miſtake; for all along that Bank, yea even over the head of the Spring it ſelf, is moſt-what Alom Stone, as is obvious to all that ſee it; and as to what you ſay, that though at firſt

when

when it falls, it be like ordinary Earth, yet at length by the weather it becomes hard as Iron, and heavy, and is fusible in the fire: I must tell you, that what is fallen down, and you denote to be Iron Stone, is not one of the hundreth, nay (I may say) scarce one of the five hundreth part, either Iron or Iron Stone, for we had much adoe amongst it all to procure a few pieces even of that Stone which may (at the best) be suspected to be Iron Stone; for indeed those heaps are most what nothing else but a farraginous mixture of many sorts of Stones, Sand, Earth, &c. fallen off from the Bank, and crusted together with the beating of the Sea, and so hardned by the Salt of the Sea and Weather, into confused heaps. Thus far reacheth your first way or manner of Waters being impregnated with Minerals (*viz.*) by taking in their Vapours.

The second is, when some of their Juyce is dissolv'd in the Water, and that whilst the Minerals are *in solutis principiis*; to which as before, so now we assent.

But as to the third way, (*viz.*) By corrosion of the substances of the Minerals, and that by the help of the Concrete Juyces, which extract and corrode Mineral Substances; to confirm which (*Hydroph.*) you tell us that the Concrete Juyce of Vitriol, which is of a corrosive property, being imbibed in a Spring Water, will corrode other Minerals or Metals, (so saith *Helmont* in the place before cited) that it passeth through as Iron and Alom. *Corrosion of the substance of Minerals*, pag. 46.

In answer to which, I shall refer the judicious Reader, to what I object against this (in *p.* 12, 13. of my *Hydrol. Chym.*) where supposing (in favour

to his Doctrine) a Juyce of Vitriol to be in the Water; yet how improper a *Menſtruum* would it be for extracting or corroding Mineral Subſtances, ſeeing that the Eſurine or Sulphureous Salt or Spirit had already coagulated it ſelf upon a mineral or metalline body, thereby to make up a Vitriol, which we have ſhewed before, muſt neceſſarily have thoſe eſſential principles to concur to this conſtitution: So that if the Eſurine Spirit in Vitriol muſt become a *menſtruum* to extract or corrode any other Minerals, it muſt firſt depoſite that body it hath already diſſolv'd: And therefore we ſee that if a ſtrong ſolution of Vitriol be boyl'd a long time in an Iron Pot, (which according to your opinion, (*Hydroph.*) muſt needs make a conſiderable corroſion thereof) that no more of the Iron Veſſel is diſſolv'd, then is precipitated of the innate cuprous body inherent in the Vitriol, which we find tingeth the ſuperficies thereof. Nay, if I affirm to you, (I ſhall not ſay more then I can prove) That Vitriol, whether *in fieri*, or *in facto eſſe*, cannot become a *menſtruum* for mineral bodies, nor menſtrual apperients for the humane body, till it lay aſide its firſt diſſoluable, whether it be Copper, Iron, *&c.* As to mineral bodies, it's evident, that after the eſurine or ſulphureous acid Spirit hath once prey'd upon, and coagulated it ſelf upon any mineral or metalline body, it ceaſeth to act upon any other, till it be looſened from the firſt, and then it's at liberty to be married to another, otherwiſe bodies would be ſolvents for bodies; whereas it is that Salts are the proper *menſtruums* and apperients for bodies; and as to humane bodies, we ſee that if thoſe uſually prepared Salts of Vitriol, or *vitriolum album*, be taken inwardly, act not ſuddenly as apperients; becauſe having

having in them a colocarine body, makes them hostile to the ferment of the stomach, which presently throws them up again by Vomit, which indeed is the main reason why Vitrioline Vomits are the most sudden in their operation; for if they should stay so long (as sometimes they do) in the stomach and intestines, till the metalline or mineral body be by the diluting moisture precipitated, then they cease to act as Emeticks, and only in part pass away by Stool; while the Salt which was the *menstruum* in those sorts of Salts called *Gilla Theophrasti*, or *Vitriolum Album*, becomes set at liberty, and proves an apperient of (otherwise) obstinate Obstructions; and that these Salts of Vitriol so called, as also the white Vitriol, have in them a metalline body, is apparent, by calcining even these Salts: yea, the *Vitriolum Album*, though exquisitely depurated by frequent Solution, Filtration and Distillation, or Evaporation, (as I have often done) will with no very strong fire calcine red; from whence by solution, *&c.* more of a mineral body may by art be separated.

Thus far you see (*Hydroph.*) that though we should grant a Vitrioline Juyce to be an Ingredient of the *Spaw*, yet can it not be a competent *menstruum* to corrode or extract other mineral bodies, and that for Reasons before alleadged; yea, and that notwithstanding what you quote out of *Helmont*'s fourth *Paradox*, where he saith, That that which is volatile (*viz.*) a Spirit, whether it be concrete or liquid, may corrode other mineral bodies. Pray take in the whole Sentence, and it runs thus, *Corpora non corrodunt corpora; quatenus talia neque fixa in invicem agunt: sed duntaxat quatenus alterum eorum volatile est, id est spiritus, sive is concretus est sive*

sive liquidum: Here you must know that he is treating of the Esurine Salt; where indeed if you had duly weighed what he saith a few lines afore, you might have had light enough to have led you out of your former Errors; which an ingenuous Spirit would own, though it was to the casting down his former wrong apprehension of things; for it's the truth of the matter (we contend about) that we should aim at, and not our prejudicated Opinions.

He tells you that the natural Vitriol of Iron, is made by an Esurine Salt of an embryonative Sulphur corroding a Vein of Iron; in which act of Corrosion there happens a kind of solution of the Vein, and a coagulation or fixation of the Volatile Salt: Which Salt, saith he, as long as it is Volatile, may be reckoned amongst Spirits: This Spirit (and not bodies one upon another) is this agent (and that whether it be concrete or liquid) that may dissolve bodies. Here (*Hydroph.*) take notice, that he doth not mean, nor say, that either Vitriol or the Juyce of Vitriol is this Spirit which corrodes bodies, but it is the Esurine Salt, whether concrete or liquid, (*viz.*) whether in the form of a Salt or Liquor, which proves the *menstruum* in mineral solutions. So that it's plain that either you understand not this Author, (quoting him, because a Chymist, right or wrong) or else you designedly wrest his words from his own, to speak your sence. And now how truly you say, that you have with good reason exploded, and sufficiently confuted, what

pag. 48. I say concerning this Esurine Salt, (*viz.*) that it cannot imbibe, or work upon any other Mineral then one, let the judicious Reader (upon scanning both) determine.

As

As to the fourth and last way, how the nature and vertue of Minerals and Metals do impregnate Waters, which is by confusion; I might justly reject it as not worthy further scanning, but that I find you bringing in an instance, how you understand your mixture by confusion, (a tearm I confess big enough to cause a jangle) and that is, that a Mineral that is dissoluable in Water, as Vitriol, Nitre, or Salt, may be so fully taken into the Water, as that the Water and Mineral are confusedly joyned together; every drop of the Water having something of Mineral Particles, and every particle of them mixed with the Water.

To which I answer, *(Hydroph.)* that if so you expound your mixture by confusion, as when Vitriol and Salts, as Nitre, *Sal marine*, &c. are dissolv'd in Water, I pray you then what mean you by regular or uniform mixtures of bodies? how differs this from the mixture of Juyces of Minerals, and amongst them, of the Juyce of Vitriol (according to your own judgment) in Water? either this confused mixture is the same with that of the Juyce (as you speak) of Minerals, or not? if the same, then it is confusion without jesting, a multiplication of Entities (at least the *Entia rationis*) without cause: if it be not the same, then you should have done well to have shewn us the difference, and so put the matter beyond dispute; as you lay it down, I see no ground of distinction at all: for you say, Every drop of the Water, hath something of the Mineral Particles, and every Particle of them is mixed with the Water; that is in short, they are mixed *per minima*: How these should be confus'd, and yet different from the mixture of the succulent parts of Minerals in Water, is (I confess) beyond

my understanding in Philosophy. If you had (*Hydroph.*) brought the matter to a compute, and given the proportions between bodies and their *menstruums* in other kinds of your supposed mixtures, then your notions had not been so confus'd but we might have distinguished them. But by the by, I would a little take notice of that instance you bring out of *Galen*, treating of the four Elements meeting in every mixt body, *Ea tota per se confundi, & sua eorum substantias misceri docet*; by which it should seem as if the four Elements, in their combination to make up the composition of bodies, were one by confounded, and hand over head jumbled together; me thinks no regular or uniform mixtures should hence arise in the beautious and wonderful compage of the World; but all would yet remain unhatch'd out of the first confused Chaos or primitive Hyle; and instead of an uniform mixture of the constituent part in the Genesis of mixt bodies, guided by Spermatick Principles, according to the Mandate of the Primitive Fiat; all mixed bodies would either appear so confus'd in their constitutive parts, as we could not difference them one from another, or else they would be no otherwise intelligible to us, than so many blanks upon which confusion was writ. But this time, without doubt, the Reader may discover the dimness (not to say confusedness) of *Galen*, and this his Sectators Intellectuals in this point of Philosophy. *pag.* 53.

My main Fort yet standing,

Now come we at length to view your Artilery, and your Cannons, wherewith you intend to batter down my main Fort (yet standing) to the ground. My chief Argument therefore, which I urge against the existency of Vitriol in the *Spaw*, and at which you

level your battering force, is no less then what is confirmed by Autopsy; and that is, that my ingenious Friend, the Chymical Apothecary at *York*, took some of the mineral Ingredients of the *Spaw*, which remain'd after the evaporation of the Water, which he had from your self; those he calcin'd in a Crucible for the space of three hours; and all this while, without the least appearance of any red colour, or the least foot-steps of either Colcothar of Vitriol, or Crocus of Iron. Now for certain, if there had been any thing of Vitriol or Iron in it, the discovery would have been made, and it forced to confess its nature, in its yellow, red, or purple colour, by so great a stress of fire.

Now (saith *Hydroph.*) if I prove that Vitriol will calcine white, then his Argument is invalid; and this I shall do both by the heat of the fire, as also of the Sun. First, By the heat of the fire, witness that of *Swelfer*, *Vitrioli veneris pulverisati, & ad albedinem parumper calcinati.* Secondly, It will calcine white by the heat of the Sun, witness the making of the Sympathetical Pouder out of Roman Vitriol calcin'd white by the Sun.

To which (*Hydroph.*) I answer, That had you been so throughly verst in the Chymical Art as you pretend, you had not set your Guns so furiously to work to so little purpose: That Vitriol should by a gentle heat of fire be so altered, as to be dryed to a white colour, is a thing I deny not; but that this alteration to a white colour, should be the effect of calcination, is a thing I cannot admit: For if after your supposed Calcination, you suffer your white Pouder to be dissolv'd, filtred and evaporated, you will find it appear Vitriol again as green as at the first, which it would not do, if it had under-

gone a thorough calcination; so that your great mistake depends upon your supposing that whiteness to proceed from a calcination, when indeed it is onely an exiccation, and no more but a degree to calcination, *parumper calcinati*, as you instance out of *Swelfer*: For the same degree of heat which will blanch Vitriol, is even requisite for the exiccation of Plants, to make them quickly pulverisable.

And as to your second Argument from the calcining Vitriol white by the heat of the Sun, drawn from the calcining Roman Vitriol white by the Sun for the Sympathetick Pouder. The return is the same as before, being onely an exiccation of the superfluous moisture of the Vitriol, and that done by a degree of heat from the Sun equivalent to that exiccation performed by the fire upon the same subject matter.

Now me thinks (*Hydroph.*) you have not laid your Argument diametrically against our Autoptical Experiment; for in ours the calcination was truly performed, being urg'd by force of fire in a Crucible; yours is but a slight exiccation: Now if you had proved that Vitriol by a strong calcination in the fire would have become white and have continued so, you had followed your Argument closely. But this contradicts matter of fact, easily experimented by any person who was willing to be satisfied in the truth thereof, in as much as Vitriol in a gentle degree of heat, whether of fire or the Sun, by an exiccation of the redundant moisture, becomes white; after which if the fire be increased, it turns yellow, then calcines red, and lastly purple, driving away thereby the menstrual Salt, which had incorporated it self with the metallick body.

Now

Now to prove, that these Minerals, upon their dissolution in this Water-Spring, must necessarily deposite what other colour they had, you quote *Paracelsus* in these words, *Videtis metalla & mineralia similitudinem nullã habere eum corporibus illis, ex quibus generata sunt*: In the englishing of which, I perceive you soyst in two or three words of your own: to make him the better to speak your sence, you translate the words thus, (to wit) you see that Metals and Minerals (dissolv'd in Water) have no resemblance with those bodies out of which they are generated: those words (dissolv'd in Water) I find not in the Author. But *Paracelsus* explains more fully what he means, even in his very following words, which you leave out, *(viz.) Hæc enim aqua sunt, cujus similitudinem metalla non exhibent, sicut autem metallum aqua fuit, sic visissim aqua fit lignum, fit gramen*, &c. Here *Paracelsus* is (as by the scope of his words may be discerned) discoursing of the dissimilitude of bodies amongst themselves, though from the same subject matter, and therefore urgeth that Metals and Minerals, though originally from Water; yet (while such) bear a dissimilitude to their first subject matter, Water, for that Water which was the material principle of those bodies, by the superinduction of metalline and mineral Seeds, was before the determination thereof by such a Seed, as equally alterable into another body, as (for instance) of Trees, or Grass, *&c.* as into that of metalline or mineral bodies: And this is the genuine sence of *Paracelsus* in that place, which yet he further illustrates by that next instance you quote, *Videtis vitriolum aliud viride*, &c. *id si in aquam resolvatur, colorem omnem deponit*: where again, in your translation thereof, you

miss

miss his sence, and wrest it to your own, and that either designedly or ignorantly, for you translate it thus, (*viz.*) You see one sort of Vitriol is green, another blew, but if it be resolv'd in Spring Water, it layes down all its colour; how (*id in aquam resolvatur*) will bear that translation, I do not understand; and here, would I appear Pedantick, I might severely chastise you, as you have indeavoured to lash me for smaller matters; for it is not *in aquâ*, but *in aquam*; and how it should bear the interpretation of Spring Water I know not, but let that pass.

Now as in the former instance *Paracelsus* urged, That Metals and Minerals have their original from Water, to which (whilst such bodies) they carry no resemblance. So in this latter Example he affirmeth that Minerals (for instance Vitriol) may be resolved again into Water, and then they loose their colour; yea, other properties which (otherwise whilst mineral bodies) are essential to them; and that it was so, I may (*Hydroph.*) take leave to tell you, that both *Paracelsus* and *Helmont* could by their Liquor Alkahest reduce mineral and metalline bodies into simple Water; to confirm which, you have instances enough in my *Hydrolog. Chym.* In the third instance out of *Paracelsus*, you are as much (if not more) besides the cushion, as in the two former, it runs thus, *Similiter & auri color flavus est, qui tamen in transmutatione sit purpureus, si per transmutationem hanc resolvatur, tunc aquam nullam tingit amplius nec colorem in se continet.* You may remember (*Hydroph.*) that at our last Discourse the Gentlemen at the *Spaw*, I prest you to signifie what you meant by that instance, and why you brought it in: you replyed very gravely,

gravely, after a little pause, let *Paracelsus* speak for himself. A fair return, *Paracelsus* must speak for himself, truly so he doth, and properly enough, for ought I know, as to what he is there treating of. But indeed (*Hydroph.*) either he or some else ought to have spoken for you, seeing you had so little to say for your self why you forced an Author to speak in your sence, when you your self did not know, nor could give any account of your reason of transcribing that Sentence out of *Paracelsus*. For first, you make your additions in the translation thereof, the better to colour your pretence, though without reason; you translate it thus, (*viz.*) In like manner, though the colour of Gold be yellow, and in transmutation it become purple, yet if it be resolved by this transmutation, that is, in Spring Water, it tinges the Water no more, nor does it keep its own colour. Your addition, (to wit) that is, in Spring Water, is a seeming interpretation; whereas indeed *Paracelsus* speaks nothing at all in that place of Spring Water, I say, besides your own figmental additions to, and half constructions of this quotation out of *Paracelsus*, you do not (notwithstanding) make it sadge to your purpose: For what *Paracelsus* meant by transmutation, (by querying with you) I found you knew not; and what his resolution of Gold by this transmution was, you did as little understand. But that I may give you a little help to what you might possibly mean (even at the best) for your purpose: We will suppose that you imagin'd Gold dissolv'd in *Aquâ Regiâ*, of what sort soever; and that after precipitation with *Sal Tartari*, or any *Alkali*, it should come to be purple; which yet it doth not, witness the *Aurum Fulminans*, which is yellow; or that by eduleora-

tion

tion, let us suppose (at the best) that it may become purple. Now (*Hydroph.*) if you could produce any such purple coloured Gold, made by what skill or art you can, that would thereby be resolved in Spring Water, and yet would not tinge that Water, nor keep its own colour, *Eris mihi magnus Apollo.* Here perhaps (*Hydroph.*) may return, as a *French* Man once did to the learned *Kircher*, who having sent him a Scrowl of a Character (which he had writ at random) to explain; which when *Kircher* had undertaken, and with a great deal of pains & dexterity of Art (as he thought) had interpreted it, according to the sence and meaning of the Author, returned him an answer to this purpose. *Sir, You have explained my Character singularly well, for you have interpreted that of which I knew not the meaning my self, having scribled it carelesly and at randome.*

pag. 60. 61.

Had these (saith *Hydroph.*) been perfect Minerals in their kind, (*viz.* Vitriol and Iron) they might with good reason have expected they should have calcin'd of a red or purple colour, *&c.* but if the Mineral (*viz.*) Vitriol, or the Iron be imperfect, and only *in succo primitivo*, no such thing can be expected.

To which I answer, That if one of these two, which you call imperfect Minerals, (*viz.*) Iron, may by force of fire be actually brought into the *Scoria* of Iron, which indeed is Iron it self: Then by a parity of reason, may we conclude that the other imperfect Minerals, Vitriol (if such there be in the *Spaw*) may by force of fire be brought to undergoe the like mutations of colours competible to it as a perfect mineral body: The assumption I shall

prove

prove from your own words, (*p. 67.*) where you ſay, You calcin'd the black Sediment precipitated by the ſtipticity of the Gall, which you call Iron: This you calcin'd in a Crucible in very ſtrong fire, and it became of a dark brown colour, and turn'd to a groſs Pouder hard as a Cinder, and was no other (ſaith *Hydroph.*) then the *Scoria* of Iron; and in the ſame page you call them *lamina ferrea*, or flakes of Iron. The conſequence is ſo evident, as needs no further demonſtration; for if the Juyce of one imperfect Mineral, (*viz.*) Iron, becomes by force of fire perfect Iron, (*viz.*) the *Scoria* of Iron. Then why may not the other imperfect Juyce, *viz.* Vitriol (if ſuch (as I ſaid) there be in this Spring) by the like ſtreſs of fire, be alſo brought to undergo thoſe changes of colour belonging to the actual or perfect (if I may ſo call it) body of Vitriol.

And as to what you ſeem to ſolve in saying, Vitriol is not imbibed in *Scarbrough* Water corporally but precolated; we deny it to be there any manner of way, either in Juyce or by precolation, perfect or imperfect, *in fieri*, or *in facto eſſe*, or what other way you can name; from all which it appears, that if there be Iron in the *Spaw*, there is no Vitriol, becauſe Iron is apparent, but Vitriol not.

As to what you report out of *Falopius* concerning a Mineral Spring near *Rome*, *pag. 64. In Agro voleterano, in illâ aquâ eſt ſuccus & albus, & eſt ſuccus Calcanthi, non Alumi-nis.* Now (quoth *Hydroph.*) it's very probable that this white Juyce would make a white Salt by calcination, after its ſeparation from the *menſtruum*; and truly it's as probable *Hydroph.* never tryed a calcination of a white vitrioline Juyce, or of a white Vitriol; if he had, he would certainly have

been

been of another mind, in as much as any white Vitriol being calcin'd, passeth through all the colours ascribable to other kinds of Vitriol; besides which, what is this white Juyce to the *Starbrough Spaw*, seeing no vitrioline Juyce, of what colour soever, is apparent therein? and therefore what ever you quote out of other Authors, may indeed prove Vitriol to be existent in those Springs they treat of; but it's nothing, *ad Rhombum*, as to prove the existency of such a Mineral in this *Spaw*, unless it could be made demonstrable by matter of Fact, which you neither do nor can; not to say how pretily you confirm what you would aim at by a palpable contradition in *p.* 65. of your *Mimick*, which I have gently touch'd upon *p.* 22. As for your inference which you draw from your *Argumentum ad hominem*, (as you call it) where you say, That seeing I grant that this (*viz.*) the *Sweet Spaw* at *Knarsbrough* hath Vitriol and Iron, and yet calcines white, *&c.* I answer, You take that for granted, against which I demonstratively argue in the Negative, as the Reader may see, *p.*3,9,10, 136. of my *Hydrol. Chym.* where I affirm and demonstrate that a Vitriol which contains Iron, is not Vitriol and Iron distinctly, but joyntly make up a Vitriol of Iron; and that the Esurine Acidity preying upon the *Minera* of Iron in the *Knarsbrough Spaw*, had got a slight touch therefrom, and is as it is Vitriol of the *Minera* of Iron; and hath not both Vitriol and Iron, as I have sufficiently hinted before? And from thence to *p* 76. is an impertinent Discourse of the properties of Vitriol and Iron, after such a manner indeed as is not worth the time to bestow a reflection thereon, where the Reader may please to take notice that some Galenical Physitian

do ordinarily, and perhaps no leſs learnedly diſcourſe of Simples, whether Vegetables, Minerals, or Animals, according to the four firſt qualities of heat, cold, dryneſs and moiſture; to each of which they cunningly aſcribe four degrees, whereby they ſtrictly judge of the temperature of the ſimple. Thus they ſay Vitriol is hot, that is, it's heating; Iron is dry, that is, it's drying.

Now if the temperature of Simples, and their Operation upon the body of man, may be judged according to thoſe four qualities with their degrees: Then might I juſtly query firſt, Why two Plants of the ſame ſuppoſed degree of any the four firſt qualities, are not of the ſame ſignature, taſt, ſmell and operation? Why (for inſtance) the four greater hot Seeds, Cardamoms, *&c.* which are reputed hot and dry in the third degree, ſhould not have the ſame figure, taſte and ſmell? Why theſe ſhould not be Emetick or Purgative, as well as Aſarum or Helleborſ, which are reputed hot and dry in the ſame degree, ſeeing the temperature of them, according to the doctrine of qualities, are the ſame? Why Mandrakes, Hemlock, Henbane, Opium, Solanum, Lethale, ſhould be deadly by being cold in the fourth degree, ſeeing (for inſtance) Opium is bitter, ſharp, ulcerating and inflammable? the ſigns of heat, according to the ſame Doctrine; yea, and is alſo eminently Diaphoretick in its Operation, which is irrational to conceive, can proceed from a cold quality. Why Tobacco, which is the Henbane of Peru, ſhould, according to *Monardus*, be accounted hot and dry in the ſecond degree, and yet hath a benumming and ſtupifying quality, which in it (as well as in the Juyce of Poppy called *Meconium*, or the *Stillicidium* of the ſame wounded

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ed heads called *Opium*) proceed from extream cold as *Galen* and his followers do opine? Why one and the same Plant should in its temperature or Crasis harbour two such inimical guests, as heat and cold without strugling in the Womb. As to that distinction the *Galenists* make betwixt the temperature of a Concrete, and the property of its whole substance, seems to me too slight to solve the difficulties arising from this Doctrine: For what's the temperature of any Plant, but a specifical modification of its substance? and what is its substance, as to particularities, but a different modification of its parts according to the variety of Seminal Principles?

Again, Why is *Aconitum* and *Napellus* (two mortal poysons accounted) hot and dry in the fourth degree? and yet white Briony is placed above the third degree of that rank; Why not in the fourth being above the third? and then, why not as mortal as the two former? Surely the *Galenists* forgot to add minutes to their degrees, and to rank every thing in its right Clasis. That the *Aconite* is a deadly Poyson, is evident, by the remarkable and no less lamentable example at *Antwerp*, recorded by *Gerrard*, where those who eat of the Leaves there serv'd up in Sallads, were forthwith taken with cruel Symptoms, and dyed. But white Briony is so far removed from that dangerous toxical property, as that it is sometimes taken inwardly to a ʒ i quantity, as a *Hydragogon*.

That Hemlock, Henbane, *&c.* should, (as I said) being taken inwardly, perform those strange effects in the humane (or other Animal) body, being in their temperature cold in the fourth degree, is no less difficult, then irrational to conceive that Hemlock should have such an influence up-

the animal powers of the sensitive soul, so much to eclipse them, as to cause an alienation of mind, witness the notable Story *Kircher* relates of two Seminary Priests of *Germany*, who eat of Hemlock Roots, (being mistaken by the Cook for Parsley) forthwith, even ere the Roots were well swallowed, they fell into a rage, tore off their Cloaths, and leaped into an adjacent Pond; out of which being taken, and by Antidotes restored, (save that the *toxicum* had seiz'd upon the *genus nervosum*, whereby for three years they remained Paralytick) were asked the reason why in their madness, they had thrown themselves headlong into the Water? answered, That they fancied themselves Geese, and so after the manner of those Creatures, betook themselves to the Water to swim. That Henbane should be so toxical, as that two dragms of the Seed thereof (as *Helmont* reports) being given to a Lawyer, by a mistake, instead of as much Dil-Seed, (prescribed for the Cholick) made him become so mad, as that he could not utter one intelligible word, and spoiled his pleading, *Ita insanus* (saith he) *quod nil stolidius, magisque fatuum viderim.*

But say the *Galenists*, and with them my Antagonist, There are, besides these four first, other secondary qualities, as molifying, condensing, rarifying, *&c.* As also some which they call third qualities, such as are vomiting, purging, expelling the Stone, *&c.* Yea, and that there are a fourth sort (now to the Point) call'd, Occult Qualities. These are indeed their *Asylum ignorantiæ*, to which in all *Phænomena* of difficult solution they have their refuge; for where their manifest qualities fall short in explicating the powers, and unfolding the secrets of Nature, there must the Occult *pag.* 78.

cult Qualities bring up the Rear, to the rendring of things rather more unintelligible, after the manner of an *ignotum per ignotius*.

Well, but to return to Vitriol, which our Philosopher saith is hot, that is, it's heating, yet he tells us not what sort of Vitriol that is, whether of Iron, of Copper, Silver, *&c.* For we have demonstratively made evident, that there is no Vitriol existent in nature, but hath a mineral or metalline body, as the main Ingredient of its Compages: Yea, if we should know which sort of Vitriol he intended, yet should we be at a loss to find whether it must be the whole compound body of Vitriol, or any of its constitutive Ingredients, or any parts separable therefrom by the fire; whether the Colcothar, Esurine Salt, Spirit, Flegm, Oyl, which is hot, that is, its heating?

That Iron should be dry, that is, drying; and Vitriol hot, that is, heating, we have no other Argument, then what is purely effeminate (*viz.*) it is so, because it is so; And what if *Jacobus de Partibus*, *Kircher*, *Gallen*, *Conciliator*, *Paracelsus*, and a hundred more should say so? It's but yet an *Ipse dixit* at the best; and that will not half go down with the Explorators of the new Philosophy: But it seems my Antagonist knows nothing, or very little of useful Experiments, the very Basis and main Pillars of the true Physiology; but consults rather those Authors, who themselves have frequently taken what they have from others upon trust, subscribing rather to dogmatical Placets, then willing to unravel Natures Clew of Genuine Experiments.

But that my Antagonist may not appear altogether barren of Experiments, he endeavours to illustrate the opening and drying, the deopilative and astrin-

aſtringent qualities of Iron; the former to lie in a Volatile Salt, the latter in the *Crocus* or terreſtrial part; by this Experiment, of caſting filings of Steel or Iron into the flame of a Candle, and it will burn like Salt-peter or Roſin. Theſe filings, when infus'd three or four times in Water or Wine, (as in making Chalybeat Wines) till the Liquor hath diſſolv'd all the Salt; then dry it, and caſt it into the flame, and it ſhall not burn, but the Liquor ſhall have a ſtrong taſte from the Salt.

As to the verity in matter of fact of the flagration of filings of Steel caſt upon the flame of a Candle, *Experto Crede Roberto.* But his Philoſophick remarks thereon are indeed remarkable, (*viz.*) That that which gives the flame ſhould be the Volatile Salt of Steel, is no leſs then a miſtake of a Salt for a Sulphur, an incombuſtible for a combuſtible; for no Volatile Salt whatever as ſuch, is inflamable, being indeed the eſſential properties of Sulphurs, whether Vegetable, Animal or Mineral, to take flame and burn; which that it is ſo, is evident both by a flagrable Sulphur, which we have ſeparated from Steel, as alſo by this Experiment, (*viz.*) That if in the making the *Saccharum Martis*, you hold a Candle at the top of the Glaſs, while the Oil of Vitriol is working upon it, you will find that as ſoon as it toucheth the ſteam, which aſcends from the inteſtine conteſt of the two Combatants, it will immediately take flame, and burn like as if ſo much Oil or Spirit of Wine had been fired.

Two Contradictiõs

Now that Iron ſhould (according to the teſtimony of thoſe Authors my Antag. quotes) be cold and dry, and yet according to his own Experiment ſhould take flame, is ſurely no leſs than a palpable contradiction: for ſulphureous

parts are alwayes reputed hot, so that an inch breaks no squares betwixt his Arguments and Experiments; Yea, that Vitriol which he judgeth hot, that is, heating, should be so, and yet the Spirit of Vitriol, (as well as the Spirits thereof in the *Spaw*) which in plain words, (*p.* 97.) he saith, are both Vitriol (how true we may elsewhere examine) are used frequently in most cooling Juleps, both to cool and quench thirst in Feavers; that the same numerical body of Vitriol should, as such, be both hot & cold, is not a sleight, but a gross contradiction, and argues great inconsistency and unfaithfulness to himself.

From hence to *pag.* 90. is nothing but what already hath been said, and already may (without further repetition) be reputed sufficiently answered.

*pag.*90. Here he quotes what I said, *p.* 38, 39. of my *Hydrol. Chym.* (*viz.*) That I demonstrated to him what he would not otherwise believe, That the bare solution of the Calx of Alom Stone, doth give exactly the same alteration of colour, as the *Spaw* it self, yea and as the solution of Vitriol too.

My Antagonist returns thus, I said indeed (quoth he) and so I do confidently say still, That it is the Vitriol alone, that being dissolv'd by its Mineral Juyce in this Water, takes the tincture from the Gall.

*pag.*91. Now, I pray, (goes he on) With what Logick can he argue from calcined Alom-Stone, to this aluminous Juyce that is here in the Water? Had he tryed whether the crude Stone of Alom would qualifie simple Spring Water to take a tincture from Gall, or impart any Sapor to Water, he had acted according to reason.

To

To which I answer, That to gainsay confidently, yea to persist in the denyal of what is plainly, even ocularly demonstrated, becomes not, yea, is below a Philosopher or lover of Truth. Did not my ingenuous Friend, both before your face, and in the presence of many Gentlemen at the *Spaw*, shew you to your astonishment, that the crude Alom Stone (even taken out of that place of the Bank which your self pointed to) dissolv'd in fresh Spring Water, would with Gall, give as deep a tincture as the *Spaw* Water it self? Can you deny this? The same have I also shewed before other Gentlemen at the *Spaw*, yea, and sent up some of it to be tryed before the *Virtuosi*.

The circumstances of that transaction about that Experiment, is now too tedious to relate, onely in short thus, (*viz.*) After this *Mimick* was brought upon the Stage to publick view, I made a Journey on purpose to *Scarbrough Spaw*, to make some further Experiments of that Water, where, with much adoe, ingaging my Antagonist in a Discourse about what he had asserted in his Book, querying with him about the solution of many contradictions therein inserted; which whether he was not almost driven as far as *Hercules* his Pillars, with the Inscription of a *ne plus ultra*, I shall appeal to the ingenuous Physitians, Scholars, and other learned Gentlemen who were by; and was so far gravel'd, as being pincht about a Sentence he had transcribed out of *Paracelsus*, which I press'd to know why he made use of, he was glad to refer me to *Paracelsus*, and bid *Paracelsus* speak for himself; together with many other circumstances too prolix now to insist upon, concerning which we have (as occasion hath offered) now and then glanc'd upon them.

The next morning we did, *descendire in aream*, without either our Swords or our Seconds, where controverting the matter privately, I asked him, Why he dealt so unworthily with me in his Book? why so many scurrilous invectives, and unhandsome reflections? and why he had endeavoured to cast such an odium upon me as to my Practice, when I was able to make evident, by substantial witness, the falseness and the injustice of the aspersions cast upon me, that an unprejudiced eye might easily discover a vein of fire to run through all his lines, no way grateful to any judicious person? He answered, That I had made him my Enemy, and that he had softned something therein, and had intended to have done more, but that he came more suddenly from the Press then he expected, and that I had dealt severely with him in my reflections. To whom I returned, that mine touched not his personal Practice or Concerns, but his Philosophy; and that if when he had by clearness of Experiment or strength of Argument (as he thought) found me tripping, then to have paid me, *in specie*, in my own Coyn, would have been acceptable to most ingenuous Persons. For saving a few lines (which I confess might have been put into a better dress, and which I told him he might have look'd upon as slips of my Pen, or little flourishes of youth) his gravity might have given a better president: I cared not if all the World saw the Book; and in short I told him, That though I looked upon my self bound to give a return to his Book; yet I did so much abominate that unchristian-like way of proceeding against each other by calumination, and casting odiums upon each others Practice, as I promised him (though I might possibly have been furnished with a competent

stock

ſtock of matter) never to retaliate upon him in the like kind.

After a little bickerings, and ſome experiments I made of the *Spaw* Water, my ingenuous Friend, the Chymical Apothecary, for a through-experiment whether of us was in the right, deſired my Antagoniſt to ſhew in what part of the Cliff his ſuppoſed Vitriol lay; who pointing to the place, thruſt in his Knife, and took out ſome of the crude Alom ſtone which lay under the Floſcule. That it was Alom Stone my Antagoniſt could not deny; but that it ſhould in freſh Water, with the addition of Gall, give a purple tincture, he utterly denyed; wherefore that they might not be long in ſuſpence whether it was ſo or no, it was concluded that an Experiment thereof ſhould be forthwith made, and that the whole matter ſhould hang thereon, (*viz.*) Whether Vitriol or Alom was the Ingredient in the Water; for it might be eaſily granted, that if Alom did not give the tincture, then it muſt be ſomewhat elſe, and that could be no other than Vitriol; but if that did give the tincture, then it was not from Vitriol, becauſe Alom hath been ſeparated, but never any Vitriol from the Water.

Therefore taking a Porringer of freſh Water, in which ſome of this crude ſucculent Alom Stone was ſhav'd, with addition of Galls (wherewith my Antag. was well ſtockt) and in the preſence of ſeveral Phyſitians, Scholars, and other ingenuous Gentlemen, it preſently ſtruck as deep a tincture as if it had been the *Spaw* Water it ſelf: at which my Antagoniſt trembled and grew pale, and in a ſudden paſſion told them, That he would take his Oath, that Dr. *Tunſtal* told him that it was Vitriol the laſt year; which with reiteration he averr'd: The Phy-

ficians being by, asked, Where was his witneſs? So with an Apoſiopeſis, they broke up abruptly. Thus my Antagoniſt was caſt upon the Sands with a Hurricane or ſudden ſtorm of an unavoidable Experiment; Yea, and not only the ſucculent Alom Stone, but even any of the hard Alom Stones (of which that Bank is full) we found would give a tincture in freſh Water, acidulated with Spirit or Oyl of Sulphur, if thereto Galls were added; for to make a hard compact mineral Stone to give its tincture in freſh Water, cannot eaſily be expected, according to the uniform Laws of Nature, unleſs that Water be firſt made a proper Menſtruum, by acidulating it with a ſingular and mineral Spirit proper for that purpoſe.

So that my Antagoniſt may as equally conclude, that Sulphur has neither tincture nor acidity in it, becauſe being boyled in Spring Water alone, it gives neither, nor doth it yeeld any acidity to the taſte being chewed; and yet let the ſame Water but be acuated with an Alkalie, or let the ſame fixed Salt be melted with the Sulphur, and the body of Sulphur will thereby be ſo opened, as to yeeld both its tincture as red as blood, and odour alſo, which laſt will be made to appear by the addition of any acid Juyce; yea, its acidity will plainly be evident by burning it under a Glaſs Bell, witneſs the Oil of Sulphur made after that manner: ſo that where mineral bodies are to be diſſolv'd or unlock'd, their Menſtruums are to be acuated and duly prepared.

Wherefore in confirmation of what I elſewhere aſſert in my *Hydrol. Chym.* concerning an Acid Sulphureous Spirit or Salt, which being diſſolv'd in a Water Spring, becomes a ſutable Menſtruum to make Solutions, or to take in the tinctures of Mi-

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neral or Metalline Bodies which lie in their way; I say, in confirmation hereof, I find the ingenuous *Swelfer* in his Appendix, (*p.* 97.) saith to the very same purpose, thus, *Etenim vitriolum cæruleum (quod me judice nihil aliud est quam cuprum, quandoque etiam ex venâ argentea ortum ducens in visceribus terræ a spiritu sulphuris solutum, quemadmodum viride vitriolum à venis ferri est; eodem spiritu sulphuris in terræ antris dissolutum) è cupreis venis exoritur, &c.* And that this is a sulphureous Salt or Spirit which actuates the Water of this *Spaw* compatible, as well to Alom as Vitriol, is evident, both by the profound *Helmont*'s definition of this Esurine Salt, (*viz.*) *Est partus immaturus sulphuris embryonati.* As also by this experimental Observation which confirms both, (*viz.*) That in the burning or calcining the Alom Stone, to make it capable to yeeld its imbred Salt, a Sulphur is found thrust forth to the surface of the Stone, by the force of fire, which will take flame at a Candle, and burn with a blew flame, with the same sulphureous smell as common Sulphur, which lies in a crust driven from the body of the Alom Stone, and adheres to it; of which I have some by me, and have tryed the Experiment therewith; by which it appears that that Salt, connatural with the Alom Stone, hath also espoused to it self an embryonate Sulphur, which lies dormant in all mineral acid Spirits, whether of Vitriol or Alom, this not being able to abide the force of fire in the calcination of the Alom Stone, is prelled forth to the superficies thereof, chiefly at the outside of the heap, and there appears in the real form of Sulphur, as combustible as any common one.

Thus

Thus the *Logick*, by which I argue from calcin'd Alom Stone, to the crude aluminous Juyce in the Water, is no leſs then by an autoptical induction, as apparent as the Sun at noon day, and no leſs demonſtrable, but indeed more obvious, then that three Angles of a Triangle ſhould alwayes be equal to two right Angles; or then that the Angles of incidence and reflexion ſhould alwayes be the ſame.

But that we may be the more certain, whether there were any ſuch thing as Vitriol in this *Spaw* Water, it might not by tryal be diſcovered; I therefore, for better ſatisfaction, made a ſolution, firſt of Vitriol and Nitre in diſtilled Water, mixed and evaporated them in an eaſie heat of a Sand Furnace, until they did ſhoot in Chryſtals, which were plainly diſtinct each from other, ſo as one might ſee them ſeverally in the bottom of the Glaſs.

Then I took Vitriol and Alom Salt, (*viz.* the true Alom) of each an anatical proportion, whoſe Solutions in diſtill'd Water were filtred, mixed and evaporated to Chryſtals, which alſo were diſtinct, (*viz.*) the Chryſtals of Vitriol from thoſe of Alom; Then I took the Solutions of Vitriol, Alom and Nitre, of each alike in diſtilled Water, which being filtred, mixed and evaporated, *ad cuticulam*, gave three diſtinct ſorts of Chryſtals, (*viz.*) long ſtyriated, which were of Nitre; white Chryſtals, which were from Alom; and green, which were from Vitriol, every one, in their ſeveral form, diſtinguiſhable enough to the bare eye.

But that I might leave no ſtone unmoved that might lie in my way, or upon which my Antagoniſt might have the leaſt foundation for his fictitious Hypotheſis of the exiſtency of Vitriol in this *Spaw*, that I might (I ſay) unravel to the very bottom

bottom of his Clew, whose deepest reserve (and by which he thinks he hits the nail o'th head) is fetche from a supposition of the presence of Vitriol in this Water by its Juyce, or *in succo primitivo*; I therefore took some of the Marcasite Stones of Vitriol, which I got out of the black Bog, near the *Sulphur-Well* at *Knaresbrough*, which is the *minera* of Vitriol, in which (if any where) the Vitriol is *in succo*; upon this pulverised, I poured a Solution of *Sal marine*, and let them stand together in a Matrass for several dayes; which by standing *in frigido*, extracted a green tincture from the Marcasites: This I decanted and filtred, which with the addition of Galls, would strike a tincture not inferiour to the Solution of the body of Vitriol. This yellow green salty Liquor I caused to be evaporated, in a gentle heat, in a Jar Glace placed in Sand, which shot into curious yellow ting'd Chrystals, which left in the bottom an Oaker, or *Terra Vitriolica*; after the manner as is found upon the like process with other factitious Vitriols.

That which was very remarkable was, That the yellowish Liquor wherein these Chrystals did shoot, would not with Galls strike any colour, but remain'd clear as before the addition thereof: but when I added some more clear Water, and thereby diluted it, I found that then it gave a purple colour. The very like to which, I observed to happen to a strong Solution of *Dantz*-Vitriol, brought to an oyly consistence immediately before shooting, which with the addition of Galls I found would give no alteration of colour; but when I diluted it with more Water, it then gave its purple tincture, and that the deeper by how much (to a certain proportion) the more Water I added; just as some *men-*

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ferments may be graduated too highly, and made too strong to corrode or dissolve their proper bodies; the Solutions of which they cannot perform till they be made weaker. Here if I should tell my Antagonist, That I know by a *menstruum*, (not rare amongst Chymists) with the addition of mine or his breath, how to calcine a Metal, (*viâ humidâ*, as the Chymists speak) without which (or somewhat equivalent thereto) the humid calcination of that Metal cannot be performed, also how to melt another Metal (prepared after a certain manner) with the help of one single Lamp, unassisted by any blast, he would, without doubt, look upon them as Paradoxes.

But to confirm yet further the existency and precedency of Alom in the *Scarbrough* Water; I observe that in the very *minera* of that Stone and Earth, found upon the Bank, a thin Scale of a bright Chrystalline Marcasite, of the very colour and brightness, like another which I do, by an artifice upon that Water, separate therefrom, which is indeed a bright clear Talk; yea, I find other gritty parcels of a fabulous Earth, much-what like the others, separated from the *Spaw* Water by the foresaid Artifice.

Now from a collation of Experiments, these following Corrolaries will naturally result.

First, That a Mineral, in its crude succulent parts, may easily be dissolv'd in Spring Water alone, when its more compact body, whose parts are lockt up more strictly, require a sulphureous Menstruum to dissolve it, or take it in pieces; witness the crude succulent Alom Stone, readily giving its tincture with Gall in fresh Water, when the hard slate thereof requires Water acidulated with

sul-

ſulphureous Spirit, to open the body thereof, to make it give its vertue.

Secondly, That the Marcaſites of Vitriol and Alom, have an embryonative Sulphur connatural with them, produc'd out of the ſame Mineral Seed; for inſtance, the Sulphur cruſt, ſeparated by Calcination of the Alom Stone; and in the Vitriol Marcaſites, I find, that putting them into the fire, they burn of a blew flame, and have a ſulphureous ſmell; in both theſe the Sulphur is really anſwerable to the common Sulphur or Brimſtone.

Thirdly, That ſeveral Mineral Salts, and other connatural bodies may conſiſt diſguis'd under one liquid Mask; which when taken off by a gentle diſtillation or evaporation, each ſhews it ſelf in its own likeneſs. Thus Alom, Vitriol, and Nitre, being diſſolv'd in Water, and ſo mixed together, appear in a liquid form, with very little diſcrimination; but when this Water is taken away by eaſie diſtillation or evaporation; then they appear, *ſtatu quo prius*, (*viz.*) Alom, Vitriol and Nitre, again, each in their ſeveral ſhapes. Thus the ſeveral conſtitutive Ingredients of the *Scarbrough Spaw* Water, whilſt under that liquid Mask, ſhew as one ſimple limpid tranſparent body, but take off the Mask, (as aforeſaid) and then they appear, each in their own form, ſuch as they were before their Solution in that Spring.

Fourthly, That the *minera* or Marcaſites of Alom or Vitriol, do as really give their tinctures, or yeeld their Solutions in Water; yea, do every way anſwer the operations agreeable to what is expected, or may be performed by their factitious bodies: Thus the ſolution of the ſucculent Alom Stone, gives the ſame mutation of colours, as the Liquor drawn

from

from the body of the calcin'd Stone; so in like manner doth the solution of the Vitriol marcasite in Water, give the same tincture by Galls, as the factitious body of Vitriol doth, yea, and precipitates the same Vitriolick Oaker, or yellow Sediment, as the other doth.

Fifthly, That a mineral or metallick solution, may have its parts so concentred, as it may not admit of that alteration of colours, compatible to the same solution diluted or thin'd. Thus the strong yellowish Liquor made from a solution of Salt, extracting the tincture from the Marcasites of Vitriol, would not with Galls give any alteration of colour, which yet it would do, when diluted, by adding more Water thereto; and thus a strong solution of Vitriol would strike no purple, nor other colour with Gall, when yet the same diluted did so.

But the truth is, (saith my Antagonist) *pag.91.* I have tryed it of that sort of Alom-Mine which is in the Cliff near the Well, having broken it to Pouder, and infus'd it in Spring Water some hours, and it received no tincture from Gall: Nay, I calcin'd that very Stone, and then dissolv'd it in Spring Water, and yet it received no tincture from Galls.

Which how true, I shall appeal to those many Gentlemen at the *Spaw*, who saw the Experiment ocularly demonstrated, yea, the *Royal Society*, to whom I sent up so much as was sufficient to pass the test before them; yea, to those who have seen the Experiment tryed at publick places and elsewhere in *York*.

To confirm his Opinion, That Alom Stone gives no tincture, nor yeelds any vertues to Water, my Antagonist brings in this instance, *p.* 29. (*viz.*)

That

That at the Alom Mine at *Whitby*, in the middle thereof a Spring of fresh Water breaks forth, having twelve fathom of Mine about it; which yet gives no tincture with Galls, having taken no vapor, odor, or sapor from the Mine.

To which I answer, First by observing how inconsistent my Antagonist is to what he declares, p. 16. of his *Mimick*, accounting with *Kircher*, That Spring Water is a proper *menstruum* to take in the vertues of Minerals and Metals; witness that at St. *Lucas* in *Italy*, which hath imbibed Iron and Alom; another in *Germany* impregnated with Alom and Nitre; and yet here denies it either to take vapor, odor, or sapor from the Mine it passeth through: Next to which I endeavoured, by climing that steep Bank at *Whitby*, to have examined the source of that Spring; but having not time, I procured this account thereof from an ingenuous Friend, (*viz.*) That it runs not through the Alom Work, but under the bottom of the stony Quarry, full of Cleffs, (about which there are divers Earths about the height of eight or ten yards to the surface of the ground) underneath which Quarry is a Mine, in colour much resembling that of Alom; but is not the same in nature with it, nor accounted so by the Workmen, but is usually called by them *Doggers*, or *Cats-heads*; betwixt which, and the aboveſaid Quarry, issues forth that Spring, and therefore no wonder it partakes of no vertues therefrom; in some of these *Cats-heads*, being broken, are found in the middle thereof, a kind of transparent Talk.

Thus as he concludes, Alom Stone to give neither vapor, odor, or sapor to spring Water, (which how true let the World judge.) So he further proceeds to tell us, That neither doth *pag.* 93.

Iron

Iron give any tincture in Spring Water with Gall, nor yeeld any Sediment upon evaporation; witness the Spring of fresh Water which runs out of an Iron Mine near *Barnsley*, upon the edge of *Derbyshire*; the which my Antagonist contradicts, by closing with what he relates out of *Paracelsus*, by which he hints (in his own words) as if simple Water alone were sufficient to imbibe a Metal, (as Iron) while it hath not attained its perfection; which in truth is the case of the Iron Mine at *Scarbrough*, and yet here (according to him) it neither gives tincture with Gall, nor yeelds any Sediment; but this also contradicts his Experiment of a Vitrioline Salt made out of Iron by an infusion in Water.

A brief Account of the Alom-Works At WHITBY.

NOW, becauſe I find that Alom is the chief and eſſential Ingredient of the *Scarbrough Spaw* Water, I ſhall (for further illuſtration) give my Obſervations concerning the *Alom-Works* at *Whitby*, to which place I purpoſely made a journey, for my own and others ſatisfaction; where firſt I obſerv'd, that it is not every Alom Mine that the Workmen will imploy their labour and time about, as finding ſome that are unripe, and therefore unfit to extract the Salt therefrom; amongſt which that blew Slate or Earth (which they often find near the true ripe Stone) which they call *Doggers* or *Cats-heads*; and other flaty Stone mixed therewith, they reject: which I cannot better parallel, then with thoſe unripe Mines which the Cole-miners often upon digging find, and call *Smitts*, as being an imperfect Cole, whoſe Sulphur is not brought to maturity, wherefore they reject it as an unprofitable and uſeleſs Fuel; and yet theſe may no leſs be reputed Coles, then the other unripe Alom Stone may be accounted Alom *Minera*: ſo that to expect that theſe crude Stones or Earth (which are akin to true Alom Stone) ſhould give a tincture with Galls in

fresh Water (as some, not very cautiously, have attempted) is no less irrational, then to expect from these *Smitts*, all the essential qualifications belonging to the true ripe Cole, though both are Cole.

Next I observe, that when they have pitch'd upon the right *Minera* of Alom, they calcine it thus; first, digging great quantities thereof; then heaping it *Stratum super Stratum*, (*viz.*) a layer of Coals, and a layer of Stones; piling them up a great height in a vast bulk, like a little Mountain, they fire it below, and so let it burn day and night, till the fire of its own accord ceaseth, or rather till all that is combustible be spent; when the Stone hath throughly taken fire, the whole Mass burns much more intensely then at the first, and that because of a plenteous Sulphur connate with the Stone, which then becomes fired, and is thrust forth to the superficies of the Alom Stone, being a real combustible Sulphur, which as a Crust cleaves to the *Minera*, of which I have some by me, sent by an ingenious Friend.

Thirdly, We observe that this Calcination is therefore made of the *Minera*, that it may the better and more plentifully yeeld its innate Salt, partly by opening the body thereof by this previous Calcination, and partly by preparing it for a Magnet for the nitrous Particles flowing from the Air to settle thereon; with which, by being the longer exposed to the Air, it becomes the more saturated; plentifully, I said, because the natural Stone, unprepared or calcined, will sometimes separate its connate Salt to the superficies thereof, by the bare solitary heat of the Sun: as I am by an Autopsie confirmed, in that I have sometime seen an Alom Slate spontaneously sweat forth its own Salt; which being dis-

solv'd

solv'd in fresh Spring Water with the addition of Galls, I found would immediately strike a deep purple, and with Oil of Sulphur and Vitriol become clear; and then opace again with the addition of Tartar, *&c.*

Fourthly, The *Minera* being thus opened by the Calcination, they make a Lee thereof, in Pits made within the ground, which run one into another by Pipes or Channels; this Lee or Solution, they pump into Troughs which conveigh it into leaden Cisterns, which will, with Galls, strike a deep purple colour, whereof they have whole Tuns, which will give that tincture, (as any who pleaseth may try.) This Liquor consists both of a Sulphur, Alom, Salt, and an Oaker, which as it runs along the Troughs, drills in some places through the crevices thereof, and by the heat of the Sun is congealed into Salt, of which I procured a quantity to make Experiments with: This Salt will also (being dissolved in fresh Spring Water, and filtred) give the purple colour with the addition of Galls.

Fifthly. This Lee boyl'd up to such a height in leaden Cisterns, is pump'd into other Cisterns, and there it precipitates a great quantity of a yellow sulphureous earthy Sediment, and so becomes purged of its dross; then is it conveyed into other Cisterns, where it meets with a decocted Lee of Kelp and Urine, and thence (if I mistake not) is pump'd up into the first Cistern and boyl'd again; then lets fall another Sediment, and then is sent into low Cisterns within the ground, where it in part shoots; what doth not shoot, is pumped up into a boyling Cistern, and therein is brought to its due height; then is it pumped into great Tun Caskes, where it shoots into that form we find the factitious Alom

of. To the last decoction, in the boyling Cisterns, is alwayes added its Mother, which is a Liquor which alwayes remains after shooting, and contributes much towards the chrystallizing of fresh Alom Liquor.

But in their last decoction, which is performed in their roaching Pan, they boyl up that part which before was shot into grains in the lower Cisterns, together with that which did not shoot, (and all after the mixture with the additional Salts) into a due consistence, and so they let it run into the foresaid Tun-Casks to shoot.

That this aluminous Salt is esurine and sharp, (as we have said in our *Hydrol. Chym.*) as well as that of Vitriol, is evident by the Experiment of putting a plate of Iron, suppose of about a quarter of a pound weight, into the last boyling Liquor, (which I caus'd to be tryed) which in a few hours was totally corroded and dissolved, which in longer time would scarcely be toucht, when covered with a broad cloth, shred or list; and what is remarkable in this (but common to other mineral *menstruum*s fretting their proper bodies) was, that while the Iron was dissolving, the Liquor did ferment, boyl and rage more than ordinarily; which when the Solution was over, ceased, although I must confess that it's probable, that the addition of the Salts of Kelp and Urine, may promote the corrosiveness of this Liquor, and may make it the more readily dissolve Iron, and perhaps other Metals, if they were tryed in it.

And were these Salts of Kelp totally alkalizate, (after the manner of the fixed Salts of common Vegetables, made by the calcination of Plants, by naked force of fire) would certainly prove destructive to

to the Alom Work, and that becauſe the laſt are indued with a ſaltineſs, contrary and quite deſtructive to all acid Salts, which after a ſharp conteſt would terminate not in Alom, but in a *neutrum quid*, (*viz.*) *Tartarum Aluminoſum*. But the Lee made out of the burnt Sea-wrack or Kelp, is over balanc'd with a Marine Salt, which (by a continual preſſure or agitation of parts) works it ſelf into the texture of thoſe Sea-faring Plants, by unhinging ſome parts of their firſt compoſition, whence the brackiſhneſs and ſulphureous twang of the Lee of Kelp is produced.

The addition of thoſe Salts, (*viz.*) of Kelp and Urine, perform two things, (*viz.*) firſt, cauſe a further ſeparation of a Sediment by the precipitation of a kind of Oaker from the Alom Liquor; and next to that they add weight; and a third is not wanting, (*viz.*) to help the chryſtallizing or ſhooting of Alom: the firſt of which is evident, becauſe the artificial Alom will not with Galls ſtrike a purple colour, but the natural Alom with its imbred Oaker will: the laſt is as apparent, becauſe I have obſerved the natural to ſhoot in a different form from the Artificial, as I can ſhew. After the ſhooting of the Alom, thoſe yellow and green ſordes, which are rejected, are uſed as a manure to ſome grounds; and that becauſe the Alom Earth, together with the Sediment of the Kelp, become as a Magnet, which attracts (if it be proper ſo to ſpeak) the fertilizing Nitre in the Air, the main efficient of improvements of all Soyls; the which, doubtleſs, might be much promoted to a further improvement of grounds, if they were but calcin'd again, and then expos'd to the Air, by being thrown upon ground; for hereby they would become more

hungry (if I may so say) of the volatile aëreal Nitre, and make it fall the more plentifully by Rain and Dews, or Snow, and other manner of circulations of that vivifying Æther, which impregnates Grounds for all sorts of vegetation; wherefore I have advised some that live upon *Blacomore*, (not far from *Whitby*, being a barren Soyl) to burn their Alom Slate Stone, (of which there is store in that Countrey) after the manner as is done with Lime-stone in other parts of the Countrey; and when it is sufficiently burnt, to throw it upon their Fallow Grounds; from whence probably an improvement worth their charge and labour may be made of that Soyl.

Thus there are few sorts of Soyls in *England*, or elsewhere, which are so barren as may not be improved, by being artificially cultivated with what they bring forth, whether Alom-stone, Lime-stone, Marle, Cole, *&c.* Nay, there are few barren Soyles in the *Indies* or elsewhere, but have that in their Bowels, whose worth, one way or other, doth compensate their thread bare Coats; the barrenness of their outsides, being well amended by the riches of their inwards. From what is premised, will necessarily result these following conclusions, (*viz.*)

First, That to extract or separate Salts or Sulphurs out of Mineral Marcasites, respect must be had to the crudity and maturity of the *Mineral*, (*viz.*) That such a Bed is to be chosen, where the Mineral Principles are not too crude, but are brought on to a certain degree of maturity; as for instance, If a Coal-Mine be to be chosen, for burning well, it must be such a one whose Sulphur is plentiful and flagrable, and not a *Smitt*, which is but an imperfect Cole-Mine; So if plenty of Alom-Salt be intended

tended to be separated from the Marcasite thereof; then must a ripe Stone be chosen, and not that blew Slate or Earth called *Doggers*.

Secondly, That to unlock some Mineral Beds to come at their hidden Treasure, is required a foregoing Calcination by the force of fire; witness the burning of Alom-stone, before its Salt can be plentifully separated, and the burning of Vitriol in close or open Vessels before its Spirit, or Salt can be procured.

Thirdly, That the treasures these unlock'd Mineral Bodies afford, consist in a Salt, and an Embryonative Sulphur; for instance, the Salt separable both from Alom and Vitriol, first opened by force of fire, and in both is an apparent Sulphur, *viz.* In Alom it appears in an inflamable sulphurous Crust, thrust forth to the surface of the Stone; and the same is apparent in Vitriol, both from what *Paracelsus* and *Helmont* have wrote thereof; As also by the Experiment of pouring *Aqua Regis* upon Vitriol, brought by gentle exiccation to a whiteness, by whose humid calcination of that Mineral, an impetuous cloud of sulphurous Vapours arise, which if pent up in a close Vessel, would break it in pieces, though the strongest imaginable, whose plenty of fumes are not inferior to those which arise from the like *menstruum* poured upon crude Antimony, or the Spirit of Nitre upon the Butter of Antimony, or the like *Aqua Regis* upon the *Caput Mortuum* of *Viride Æris*; which three metalline and mineral Bodies, *viz.* Copper, Antimony, and Vitriol, I find by this Experiment to have the greatest plenty of a combustible Sulphur; and it is by the influence of these two, (*viz.*) Salt and Sulphur,

by which mineral and metalline bodies perform their most considerable cures upon the humane body.

Fourthly, That these acid Salts, thus opened, having their native Sulphurs dissolv'd with them in a Lee of fresh Water, do by decoctions, and the addition of other Salts, as of Kelp and Urine, suffer the Sulphurs, and other heterogeneous mixtures to separate by precipitation; witness the plenteous separation of the recremental fæces by the foresaid operation from the Alom-Liquor.

Fifthly, That the Alom-Salt, whether natural or calcin'd, is esurine and acid equally with the same in Vitriol, and capable of making solutions of other mineral bodies which lie in its way; for instance, the natural succulent Alom Salt dissolves a sleight touch of the *Minera* of Iron in the *Scarbrough Spaw* Water; and that either as it lies in the same Alom Bed, or at least in a Vein of Iron, through which the acid aluminous Salt dissolv'd in a Water Spring glides: The same doth the corrosion of the Iron in the Alom Liquor evince, according to our former Experiment.

Sixthly, That some *menstruums* may dissolve, or break in pieces the close rivetted parts of some (but proper compact) bodies, when they yet leave other bodies of a softer and sleighter texture untouched; witness the Alom Liquor corroding the Iron, when the Cloth Lists, which had covered it, was not dissolv'd, though it had been longer in that Liquor than the naked Iron; which gives light to possibility of finding out by Art and Industry, such *menstruums* as may dissolve and reduce *in minima*, the compact Duelech, or hard stone of the Bladder, and yet

yet leave untouch'd the tender ſoft membrane which makes the concave of the Bladder, and other hollow bowels.

Seventhly, That to make acid *menſtruums* more powerful and more univerſal (eſpecially as to ſolid metalline or mineral bodies) is required an addition of other Salts, of ſuch a fabrick of parts, as may not by any inteſtine commotion deſtroy each other: but may acuate each other with a mutual invigorating ferment. Thus the Salts of Kelp and Urine do that to Alom Liquor, which the addition of *Sal Gem*, or *Sal Armoniack* doth to an *Aqua Fortis*, (*viz.*) makes them diſſolve thoſe bodies, which before they could not; the one forcibly to take in pieces the body of Iron, the other the body of Gold.

Eighthly, That the Alkalizate Salts of moſt Vegetables, made by naked force of fire, do differ from the *Kali* of Kelp, almoſt *toto Cœlo*, although both be done by the like calcination; the one being *acido ſaline*, (*viz.*) that of the Kelp; the other, (*viz.*) the fixt Salts of Vegetables are lixiviate; by the difference of whoſe conſtituent parts, ariſeth the known ebullition made from the mixture of both.

Laſtly, That the *faces* remaining after the depuration of the Alom Salt, and incremental addition of other Salts, do ſtill retain a kind of Magnetiſm of the Æthereal Nitre, or at leaſt become a proper ſubject for that fructifying Nitre to ſettle upon; whereby ſome Grounds may be improved, yea, and gives more then probable hopes that the ſame recalcin'd, or the crude Stone once calcin'd, may well become a medium for the better improvement of ſome barren Soyls, as well as Lime-ſtone, Marl, *faces* of Soap-aſhes, *&c.* are by the like method made capable of enriching other Soyls.

Now

Now to confirm (besides what is said) the existency of Alom, as the chief (if not sole) ingredient of some *Spaws*, I think it not amiss to acquaint the Reader with my Observations on a *Spaw* of the same nature, which I found out the last Summer in *Barnsdale* upon *Blacomore*, about ten or twelve miles from *Whitby*; in the bottom of which Dale runs a Rivlet fed with several Springs, and walled in, (in some places) as it were, with Alom-Rocks on both sides, but more on one side then on the other, out of the Clefts of one large Alom-Bed, (whose length may by conjectural compute be 50 or 60 paces, and the depth 4, 6, 8, or 10 yards.) I observ'd several Springs to issue forth, with a yellow Sediment, along the Chincks and Crevices; one of which that had the best current, broke forth two or three yards from the foot of the Alom-Rock, having more above it. This, when I tasted, I found very much in taste to resemble the *Scarbrough Spaw*, and would with the addition of Galls, readily strike a purple tincture: being not a little glad hereat, I ordered a Bottle thereof to be brought along with me to *York*; which (there) bringing to the test, I found it to contain much-what the same Mineral Ingredients with that of the *Scarbrough Spaw*, but was nothing near so plentifully fraught therewith as the other. But however by this it was clearly apparent, that a Water-Spring running through an Alom-Bed, might (and did) imbibe the immature Juyce thereof, in so much as to give it a taste resembling that of the *Scarbrough Spaw*, and to render it as capable of readily striking a tincture with Galls, as the other, which was no small confirmation of our Hypothesis, asserted in our *Hydrol. Chym.* concerning the *Scarbrough Spaw*.

Had

Had I been at my Antagoniſts back, when he was vindicating the exiſtency of Vitriol in our *Spaw*, I might have cheriſhed him, by whiſpering (yet I would firſt have been ſure to have had an anſwer *in promptu*) this Objection, to wit, "That Dyers in the making of their Blacks, uſe not Alom "but Vitriol, yea find Alom a great enemy there-"to, alwayes mortifying the ſtiptick parts of thoſe "Ingredients, which are neceſſarily required for "that colour, and therefore might ſeem to argue "againſt Alom, and for Vitriol as the cauſe there-"of, made by Galls in the *Spaw* Water.

To which Objection I thus return, (*viz.*) That this is done, firſt, becauſe Vitriol contains a greater quantity, by much of a precipitable Ocre, then Alom, which ſhould cloſe with the flats of aſtringent bodies, for the better intercepting of the Luminous Rayes, whereby that colour becomes made; next, becauſe factitious Alom having great plenty of Urine, the Spirits or Salts thereof doth precipitate the Ocre of Vitriol, and alſo deſtroys the acidity thereof, which ſhould otherwiſe bind in its Ocre, and confirm the ſtiptick or aſtringent parts of Galls, Sumach, Logwood, Elder Bark, *&c.* frequently uſed for Blacks.

A Supplement to the Sweet-Spaw At KNARSBROUGH.

WHat I have said in my *Hydrol. Chym.* concerning the *Sweet-Spaw* at *Knarsbrough*, I find no reason to reclaim, notwithstanding the carping of some, by the instigation of others; for that it hath imbibed but a small quantity from a *Minera* or Marcasite of Iron, is apparent; first, because upon its evaporation it leaves an insipid dark coloured Pouder, arguing that the Vitrioline Marcasite, over which this Spring Water glides, is very thin and lean, of a Vitrioline Acidity, and that is the reason it coagulates not Milk, as do the *German* Vitrioline *Spaws*, and some of our own: which happens not as Dr. *French* imagineth, from a volatility of its acidity, which evaporates before the Milk boyls, but rather from the inconsiderableness of the acidity, and the easie precipitation of its Ocre.

Secondly, By the great quantity of that Water which is to be drunk, before any sensible Operation can be made, either by Stool or Urine; insomuch as it gives just cause of suspition that it is most-what from the weight of that Water pressing upon those Emunctories, which chiefly gives energy to its Operation.

Thirdly,

Thirdly, The ſame is evident from the Mineral Waters, which are Springs, paſſing through ſome Vitrioline Marcaſites, which are found in Cole-ground, of which I have ſome by me; with theſe are thoſe Springs, drilling through Cole-Mines, often impregnated, many of which have a Vitrioline taſte, and will ſtrike a purple tincture with Galls, of which ſort is Old Town *Spaw*, and ſome near *Leids* and *Hawton*, &c. ſome of which have a ſleight Iron-like, or vitrioline taſte, and yet are ſo thin and poor, as not to be able to give any tincture with Galls, while others of them that are ſtrong, give both tincture and taſte.

Fourthly, The ſame is apparent by obſerving, that all theſe languid vitrioline Waters, if they either reſtagnate, being expoſed to the Air, or by motion be carried to a great diſtance, and if by either way, a little yellow Sediment be precipitated, then forthwith they become effete in their vertues, and have neither any diſtinguiſhable taſte, nor will give any colour with Galls, but degenerate again into ſimple Spring Water. So that the ſuppoſed Spirits of theſe Waters are only imaginary and mere Chimera's, no where exiſtent, but in the brains of thoſe who conceive them.

For further confirmation of what I have already ſaid, and ſhall now further add concerning this and other the like mineral vitrioline *Spaws*, I will elucidate it by this following Experiment, *(viz.)* I took a bright Cuprous, or Vitrioline Marcaſite, found about the ſurface of Cole-Mines, and afterwards expoſed to the Air, upon which (without any other preparation) I poured ſimple diſtilled Water in a Jar Glaſs, which, *in frigido*, did immediately receive a vitrioline taſte; and being forthwith

filtred

filtred from the Marcasite, struck a deep purple tincture with Galls, as deep as any vitrioline *Spaw* I have yet met with; its taste was exactly like that of the *Sweet-Spaw*, we are now treating of, and would, as other the like Vitrioline *Spaws*, be reducible to its pristine clarity, by the pouring a few drops of Oyl of Vitriol; and became opace, by the adding of Oyl of Tartar, and so passed those colours found in the Vitrioline *Spaws*, as we have hinted more at large in our *Hydrol. Chym.* concerning those Mineral Waters; from which Experiment may follow these direct and collateral conclusions, *viz.*

First, That Vitrioline Marcasites are allyed unto, and generally found in those Mines where Sulphur is much predominant, *viz.* in the Cole-Mines, *&c.* yea themselves are impregnated with an immature Sulphur, witness their combustibleness, if put upon hot Coles, burning with a blew flame, and yeelding a sulphureous fume.

Secondly, That these being exposed to the Air, become the more readily ingravidated with a Vitrioline Salt, by determining the nitrous Particles, floating in the Air upon its Body, by a peculiar Magnetism (if I may so say) proper to such bodies; and this is evident, because the longer these Marcasites are exposed to the open Air, the more they become fraught with a vitrioline body, contracting a Crust, which by solution, filtration, *&c.* will easily resolve into a body of Vitriol.

Thirdly, That these, and their connatural and analogous Juyces do increase, and *(suo more)* vegetate in the Earth as other Minerals do, is apparent in that I have observed a piece of Wood invelloped with a vitrioline Crust found in the Earth, where

other

other Marcasites of the like nature have been digged, which I keep by me.

Fourthly, That these Marcasites, the nearer they lie to the surface of the Earth, and the more patent the Channels are, by which currents of Spring Water glide by them; the more readily they give their tincture, or yeeld a solution of their substance, whence some vitrioline Springs or *Spaws* become stronger, both in taste and operation, then others; and this is evident, because of the facile ingress the Air hath to these places.

Nor may this contradict what we elsewhere say, *viz.* That an Eburine Acidity, preying upon the *Minera* of Iron, gets a sleight touch therefrom, and so becomes as Vitriol of the *Minera* of Iron, which gives essence to the Vitrioline or *Sweet-Spaw* at *Knaresbrough*; for both may be true, though in various respects, from different Soyls; in as much as there are even in these Marcasites a connatural acid Juyce, reasolvable by the confluence of Air, which seizeth on an embryonative Sulphur of Iron, essential to those Concretes, which are carried together in their mutual imbraces, by a preterlabent Spring of Water, unto the place where they break forth, called a Spring-head, which gives Original to all or most of the *Spaws* called *Fontes acidi*.

So that all Vitrioline *Spaws* are reducible to one of these two Causes, *viz.* Either to a sulphureous acid Spirit, dissolv'd in a Water-Spring, passing through the *Minera* of Iron, the acidity dissolving the looser parts thereof, and coagulating it self thereon; or to the foresaid Vitrioline Marcasites, whose acidity being resolv'd by the Air in the bowels of Earth, takes along with it the connate immature Sulphur, or loose vitrioline Ocre; and both in one

gives

gives essence to these Mineral Waters, and from the two causes singly and joyntly, do the *Spaws* of *Knaresbrough*, *Rotheram*, *Oulton*, *Turnbridg*, *Astrop*, *&c.* take their Original; amongst which those that have but sleighter touches of the Minerals, and consequently do the more readily suffer a precipitation of their Earth or Ocre, fetch their Mineral in a longer line from the place of their Eruption, and that too perhaps from Marcasites more penurious, and less opened then others which keep their Minerals unprecipitated, and consequently their Vertues the longer.

These Marcasites, calcin'd in a Crucible with a blast, will melt and flow, especially helped with Nitre; which melted Mass being poured forth, gives no *Regulus* or metalline body, nor is so ponderous as it was before, but hath some bright yellow, or cuprous sparkles interspers'd. This in two dayes time, doth almost all fall to a black Pouder, much like what I remember hapned to a *Scoria* of Iron in the making *Regulus Martis*; which being laid open to the Air, did in a few dayes fall into a black Pouder.

Wherefore these Stones are without doubt a Metalline Embryo, consisting of a Salt and inflammable Sulphur, which hath scarce begun the matrimonial embraces of its *Mercury*, and therefore at the best is but a Mineral in the road to metallization; and being plentifully impregnated with an acid sulphureous Salt, whose other Ingredients hanging but loosly on, makes it the more readily soluble in a preterlabent Spring of Water; for I have, for experiment sake, onely suffered simple distilled Water to slide over one of them, and have found thereby that the Water would by so sleight a gliding over,

strike

ſtrike a purple tincture with Galls, which it will do again and again to freſh Water, yeelding thereby an inexhauſtible treaſure to the tranſient Springs of Water.

Amongſt theſe Marcaſites, I have one by me bright and ſparkling, cut into curious angular forms, like ſo many Diamonds of ſeveral ſizes ſet in a Ground, as if Nature in this neat peice of work, did vie with Art. And yet in the very Interſtices of theſe Diamond-like cuts, (betwixt each other) is conſpicuous the Mineral Salt which gives Eſſence and Operation to moſt of the Vitrioline *Spaws*.

Some Mineral Waters may (I confeſs) be ſuch as are only acid, being only impregnated with the Eſurine Salt of the Earth, and have no addition in them of Mineral Sulphurs, neither of Iron nor Copper; of which ſort I have taſted one near *Cheſterfield* in *Derbyſhire*, which hath a very ſtrong ſowriſhneſs, but yet, with Galls, gives no tincture, although I found a reddiſh Ocre to lie along the ſides of the Current.

The like (I doubt not) may be found in other places; all which may notwithſtanding prove very good Waters to open Obſtructions in the body of man, by their penetrative Vertues.

Laſtly, A ſolution of Salt of Iron in Water, with Galls, gives a deep purple tincture, and paſſeth all other mutations of colours anſwerable to all natural Mineral Waters. But the ſolution of Roman Vitriol, (with Galls added) gives no purple colour, but becomes a muddied Liquor, which, with Oyl of Tartar affuſed, becomes greeniſh, but

with Oyl of Sulphur wholly green. The same alterations doth *Viride Æris* suffer with the same additions. But Roman Vitriol infus'd in a weak Spirit of Urine, gives a blew tincture, which will not be altered by the addition of Alome. The same doth *Viride Æris* dissolved in Water.

Whence (by the by) I conclude, Roman Vitriol to be factitious, made up (sometimes) of Alom, with a tincture of Copper, taken in a weak Spirit of Wine, or the Phlegm thereof, and so caused to shoot into Chrystals.

A further Account of the Sulphur-Well At KNARSBROUGH.

As also concerning The Original of Hot Baths and Sulphureous Waters.

WHat I have said in my *Hydrolog. Chym.* concerning the essential cause of this Mineral-Water, (*viz.*) That it consists (as a *Spaw*) of a *Sal-marine* or fossile Salt (which differ not either materially or formally) impregnated with an embryonative fætid Sulphur, or rather sulphureous odour, is (I say) true, and may be illustrated after a double manner; And that first, by the collateral Experiments I have there inserted, concerning an embryonative Sulphur, as fætid as this *Spaw* Water it self, close locked up in the body of *Sal-marine*; as at large is made evident by that Experiment, which I shall not now insist upon.

But secondly, (and now more to the purpose) the same will better be discovered by a fresh light, let in by some new Experiments: only before I proceed to produce what I have to urge herein, I shall first (taking things as they lie in my way) make an in-

quiery what Ingredients are not (though by some supposed to be) in this Spring, (*viz.*) That neither Vitriol, Nitre, nor Sulphur, (as to the body thereof) are the constitutive Principles hereof.

First, That Vitriol is not here, is apparent; first, because it will strike no tincture with Galls, which any Mineral Water, that hath but the least participation of Vitriol will readily do; but this Spring, with the addition of Galls, gives no purple at all; next, because upon evaporation or distillation of this Water, no Vitrioline Ocre is found, with which such Waters (whilst in the vigour of their Operation) are constantly impregnated, and as certainly let fall to the bottom, when effæte in their Vertues.

Nay further, the same is apparent by this following Experiment, (*viz.*) I took some of the Vitriol Marcasites (of which more anon) found in the Bog, about 240 paces North-west from the Well, upon which, grosly bruised, I poured a strong solution of *Sal marinum Hispanicum*, made in distilled Water, and set them *in frigido* in a long glass body; from the commixture of which, I found no sulphureous *apporrhea* to arise, but the solution became green; which being decanted, and evapored, or distilled, (which last, as I remember, I did to try if it would yeeld any *effluvia* of Sulphur, but found none) I obtained a yellow Salt in Chrystals, with a Vitrioline Ocre or Sulphur at the bottom; which Salt was the *Sal-marine*, ting'd with the vitrioline body, (of which I have some by me): for being dissolv'd again in fresh distilled Water, it will, with the addition of Galls, strike a deep tincture; yea, the *liquamen* (*viz.* the Mother, as the Vitriol or Alom-workmen

call

call it) which ſhoots not, will (if diluted with Water) give the ſame colour.

By which it is plain, that as Vitriol gives no odour or *effluvia* of its Sulphur, to a ſolution of Salt; ſo neither conſequently doth it yeeld the ſame to this Salt Water, conſidered ſimply as ſuch: we will ſuppoſe that the Salt Spring in the Earth (I mean the Spring impregnated with Salt) may in its paſſage run through theſe Marcaſites of Vitriol, which are found not far from thence, (as I ſhall afterwards prove it doth) it would of neceſſity (if ſimple Salt) make ſome ſleight ſolution thereof, and give its Indications anſwerable to our Experiment, by receiving a tincture from Galls, *&c.* But by matter of fact, I find it not ſo to do; *Ergo*, Vitriol, as ſuch, is no Ingredient of this *Sulphur-Well*.

Secondly, That there is no Nitre, is as evident, in as much as, in the Analyſis of this Water, no ſuch Ingredient is to be found; for neither doth there appear any Salt which ſhoots into ſuch Styria's, nor that hath any inflammable property; both which are eſſential to Nitre, as ſuch.

Thirdly, Nor is Sulphur (as to the body thereof) an Ingredient of this Spring, notwithſtanding that it hath its denomination therefrom, being called the *Sulphur-Well*; and this is evidently apparent, becauſe in the genuine reſolution of this *Spaw* Water into its Principles, not one grain of a combuſtible Sulphur is to be found; for upon a gentle diſtillation thereof, in Glaſs Veſſels cloſely ſtopt, the ſulphureous odour goes off in much leſs then the third part of the Water, which is firſt diſtilled. The reſt which diſtils, is ſimple Water without any odour or taſte; and what remains in the bottom, (which I filtred, though it ſtood not in much need

thereof) was a *liquamen* of Salt, which being evaporated a little more, ſhot into a Salt of cubical Figures; exactly in taſte, colour, figure, *&c.* reſembling, yea, the very ſame with a Foſſil, or Marine Salt, having an inconſiderable addition of Alom Salt left after precipitation of the Sulphur; ſo that nothing of Sulphur, or any the leaſt inflammable matter can be ſeparated from the *Spaw*.

Againſt what I ſay hereof, I have met with an Objection, urg'd by a Phyſitian of note, who grounds it upon this Experiment, (*viz.*) That upon this Sulphur Water, or others of the like nature, which break forth higher upon the Bank, above the uſual Spring: I ſay, that upon theſe Waters reſtagnating, is found a kind of white Cremor, (which ſometimes is of various colours) this being skim'd off, and dryed, will take flame and burn; which by matter of fact I have my ſelf upon tryal found true.

To which I anſwer, That this Sulphur which thus ſeparates from this reſtagnating Water, is the ſame with that which ſwims upon other ſorts of Mineral Waters upon long ſtanding, being a blewiſh cream or skin, which ſwims as well upon the *Sweet-Spaw*, and any Vitrioline, or other Mineral Waters; and (as Dr. *Heer*'s ſaith) being put upon the fire, is inflamed, and yeelds a ſulphureous odor: The ſame is alſo found in an Azure coloured skin, ſwimming upon the reſtagnating *Scarbrough Spaw* Water: Yea, the like is frequently to be ſeen upon Water that ſtands long upon any Bog.

This Sulphureous skin which ſwims upon moſt Mineral Waters, is referrable to a double Original, (*viz.*) Either they are ſuch as have a bituminous matter ſwimming upon them; which with the Water

Spring,

Spring, issues forth joyntly out of the bowels of the Earth, from some sulphureous or bituminous source; witness the Spring at *Pitchford* in *Shropshire*, and in *Averna* in *France*: The *Mare Asphalticum*, called *Mare Mortuum*, which hath plenty of Naptha and Bitumen issuing from the Shores, which have store of bituminous Pits.

As also that Water, *in agro Parmensi*, according to *Falopius*, of which Water he saith, *Est usque adeò bituminosis vaporibus referta; ut ex flammâ vix sibi admotâ accendatur*: And that likewise, *in agro Patavino*; and all other Waters, upon which swim Camphire, Amber, *in succo suo soluto*, (both which by *Falopius Cardanus*, *Agricola* and *Casius*, are accounted, *è genere bituminis*) *Pissasphaltum*, *Petroleum*, *Balsamus Iudicus*, *&c.* all which are reckoned as various *species de genere bituminis*; in all which the bituminous skin will take fire and burn with a sulphureous flame; for as no Oil, so neither Sulphur, nor the *Bitumina*, will mingle, *per minima*, with Water, Oyls, and Sulphurs, consisting of similar parts, which bear no proportion with watery Particles, unless the watery be subjugated by an oyly Ferment. Or, *Falop.* 24. 6.

Secondly, They are such as (whilst in the bowels of the Earth) are impregnated with Minerals, (although perhaps not sulphureous) but when they come into the open Air, presently (especially by restagnation) let fall their imbibed Ingredients, and by continuance of time suffer a sulphureous matter to be generated *de novo*; or rather indeed, as I apprehend, by long standing, suffer the Air, by a kind of putrefactive ferment, to cause a slow resolution of the very compage of Water; and in this

gentle Analysis, makes the restagnating Water cast its Sulphur, which was not preexistent in the Water, as a Mineral Sulphur; but is (as I said) either a bituminous Cremor, or a Sulphur of Water ingendred by a putrefactive resolution thereof; which will, being dryed, take flame and burn.

That I might make a resemblance of this Water, the better to inquire into the nature thereof, I took one ounce of *Hepar Antimonii*, upon which, pulverized, I poured some warm Water; into which, filtred, we dropt some little solution of Alom Salt, (for I knew Vinegar would do it, as is usual in the making of Sulphur *Auratum Antimonii*) and it forthwith separated the Sulphur of Antimony with a strong sulphureous odor, not unlike that of the *Sulphur-Well*; and being filtred, was the same in taste and smell: by which I learned what that was which precipitated the body of Sulphur after its first solution in the Water from its native *Minera*, *viz.* That it was an Alom Juyce, in which I am confirm'd, in as much as I find a Bed of Alom, within the space of ten yards from the breaking forth of that *Well*; from the surface of whose Stones, I have taken a Salt, which (dissolv'd in fresh Water) I found would strike a deep tincture with Galls; yea, the very Stone it self, being put into fresh Water, will, with Galls, give the very same colour; of which very thing I have not met with any that have taken notice, either those who have wrote of, or others who have frequented the *Spaws*; and though I found hereby, what was the second Juyce which precipitated the body of Sulphur, and had made its *Apporrhea* or volatile odor to appear, yet was I still at a loss what this Sulphur was, or from what body, and by what solvent it first became

loosened

looſened or prepared; for all Sulphurs, whether in their own Earth, or wrapt up in mineral or metallick Veins, till they be opened by ſome particular and proper Solvents, are not fit to give forth their volatile parts, nor to ſtrike the noſtrils with their odor.

And that Water impregnated with *Sal marine*, is not ſufficient to open the body of a mineral Sulphur, and conſequently not adapted for a *Menſtruum*, is apparent by this following Experiment, (*viz.*) I took a pint of Spring Water, and diſſolv'd two or three dragms of *Sal marine* therein, (which is the quantity, at the moſt, which the *Sulphur-Well* contains of the body of Salt) into which I poured three ounces of the Marcaſites of Vitriol aforeſaid; then ſtirred the mixture very well; after that I poured off ſome of the Liquor, and filtred it, which would neither tinge Silver, nor yeeld a ſulphureous odor; but to try whether *Sal marine* would at all open the body of Sulphur in the Marcaſites, as ſome ſuppos'd, I added to the filtred Liquor, a ſolution of Alom Salt, as I had done for the precipitation of the Sulphur of Antimony, out of the ſolution of Hepar, but found no precipitation, coagulation, nor alteration of that Sulphur, either in colour or ſmell, nor would it at all tinge Silver; all which it would have done to an opened and prepared Mineral Sulphur.

This *Menſtruum* of the *Sal marine*, had indeed made ſuch a ſolution of the Vitrioline parts of the Marcaſites, as rendred it capable of receiving a tincture from Galls, but had not at all touched the ſulphureous parts thereof.

But before I depoſite my own Theſis of the true native Ingredients of this *Spaw*, which ſhall be clearly

clearly demonstrated by Experiment. I would first take off what Dr. *French* opinionates thereon, who saith thus, As for the stinking odour thereof, (speaking of the *Sulphur-Well*) that I suppose is caused from the vapours of the burning Bitumen, and adust terreness therewith; and therefore he judgeth it to be hot in its original source, in the manner of *Hot Baths*, who supposeth subterrestrial fires, fed with a bituminous or sulphureous matter, not only to cause hot Springs or Baths, but also to give being to the fœtidness of such sulphureous Waters.

Now this is (I confess) an Opinion that not only he, but *Falopius*, *Empedocles*, *Agricola*, *Cæsius*, *Kircher* and others hold; for by two wayes they did suppose all Waters to be heated, *Nam aquarum* (according to *Empedocles*) *aliæ calefiunt quia transeant per saxosa loca, quibus subjectus sit ignis ardens in metalla sulphureo vel bituminoso; aliæ incalescunt quia transeant per ipsum metallum ignitum & ardens*, as thought *Agricola*. Nor was *Falopius* much otherwise minded, who treating *de aquis Patavinis*, whose sulphureous odour is not much unlike that of our *Sulphur-Well*, saith, *Quos halitus sulphureos Patavinis, iste aquæ habent non ideo quia bulliant in metallo ipso sulphureo; sed quoniam transeant supra loca, sub quibus ebullit sulphur, ex quo efferuntur vapores ad cuniculos, & cum aquâ miscentur*; from whence he grounds his Opinion, that the difference of Hot Baths, (*viz.*) That some are intensly hot, others moderately; some tepid and subtepid, others cold; proceed from these two, (*viz.*) *Paucitas & distantia ignis*, The scarcity and distance of the fire.

In

In answer to which Opinions, I thus return, *viz.* That although I cannot deny but that there are Subterraneal Fires, which being once inkindled, feed upon sulphureous Minerals, witness the Eruptions of *Ætna*, *Vesuvius*, *Strongilo*, and other Vulcanian Mountains; yet do not I see causes sufficient to convince me, that these give being to all our Hot Baths, or that their Vapours gives fætidness to sulphurous Waters. That there may be some hot Baths adjacent to those sulphurous burnings, which probably may be heated by passing over those places in *cuniculis*, under which a bituminous matter burns, I shall not deny; witness that in *Apulia*, called *Tribulus*, where is plenty of Ashes and calcin'd Stones; and those about the Lake *Lucrinus* and *Avernus*; and that in *Agro Valaterano*, according to *Falopius*; Yet we scarce read of any in in *Campania*, where is the Hill *Vesuvius*; nor in *Sicily*, where *Mont Gibello* belcheth forth flames; nor in other places where these Eruptions are, do Hot Baths more frequently appear, then in those places where there is found not the least suspition of any Forge of *Vulcan*.

That these Subterranean Fires are not the causes of our hot Mineral Waters, or sulphureous Springs in general, will be evident; if we consider, first, that it's more then probable, that a subterraneal fire is no more naturally implanted in the bowels of the Earth, then the imaginary elementary fire is to be found *sub concavo Lunæ*; which, though it may seem as a Paradox to some, yet duly considered, it will not appear irrational; for the *materia substrata* of all inflammable concretions, whether in the Cavities of the Earth, or upon the superficies thereof, or in the common *expansum* of the Air, must be a com-

combuſtible matter common to them all, and that muſt be bituminous, unctuous, or ſulphureous; all which, whether in Subterraneal Caverns, or upon the Surface of the Earth, or in the Aereal Region, may (I ſay) take flame, and burn from ſome one of theſe three Cauſes, (*viz.*) either from Motion, Corruſcation, or Lightning; or *flamma de flamma*, one fire inkindling another; to which we may add a fourth, (which yet may be included in one of the three) (*viz.*) from ſome Mineral Marcaſites acuated by air and moiſture, inſtance Alom and Coperous Mines, being in parcels broken, expoſed and moiſtned, will gather an actual heat, and produce much more of thoſe Minerals, then elſe the Mine would yeeld; as the learned Dr. *Forden*, in his Diſcourſe of *Natural Baths*; and the ingenious Dr. *Power*, in his *Microſ. obſ. Confirmes*; yea, and that Braſs lumps (which are a ſort of Marcaſite) being laid in heaps, and expoſed to the moiſt Air, or ſprinkled with Water, will ſmoke and grow exceeding hot, and ſometimes take fire, and burn all that is about it, as the foreſaid Dr. *Power* proves: So the Mines of Tin-Glaſs, expoſed after the ſame manner, to the moiſt Air, will become very hot; and Quick-Lime will do the ſame.

The like Dr. *Forden* obſerves in thoſe Stone Coals called *Metal Coals*, which are mixed with a Marcaſite, containing ſome Mineral Juyce, which receiving moiſture, doth dilate it ſelf, and grow ſo hot, as oftentimes great heaps of thoſe Coals are kindled thereby, and burnt before their time, as hath been ſeen at *Puddle-Wharf* in *London*, and at *Newcaſtle*: although theſe laſt I account do not much differ from the aforeſaid Coperas Marcaſite.

Now

Now seeing that all combustible Concretes may contract a heat, yea, may actually take flame, and burn from some of the foresaid causes; witness the heating and firing of a Coach-Wheel, by too rapid a motion; the burning of Houses, Trees, Men, &c. by Lightning and Thunder; the taking flame of one combustible matter by another; and lastly, the self-inkindling of a Ryck of Hay or Corn, which hath been laid up too moist; and the taking fire of several Marcasites, by being exposed to the moist Air, as aforesaid: Therefore I see no reason why a Meteor or Comet, which suppose brought to that body of sulphurous Exhalations, and taking flame from its own motion, or from Lightning, or from what other cause, should less be reputed an Elementary Fire, *sub Concavo Lunæ*; then those subterraneal fires kindled (according to all probability) occasionally (not to say accidentally, *quoad nos*) from some of the foresaid causes, should be accounted native to the Earth, or naturally implanted therein, for the production of all Mineral and Metalline bodies: so that as the one is irrational, and is exploded by our modern Philosophers; so consequently the other may seem as irrational, if we do but further consider,

First, How impossible it is for actual fire to become the cause of generation of Minerals or Metals, as some suppose, who imagine the Fire as a Native born in the Earth; seeing fire, I mean, flaming or glowing fire, is by the gravest of Philosophers so far rejected from amongst the causes of Generation, as it is rather justly to be reputed *mors rerum artificiosa*, the death or destroyer of all things, committing actual rapine upon all the Seminary Principles of bodies, which fall under its tyranny, dispersing

and

and dissipating those Concretions suddenly, which Nature (helped by a generative heat working upon imbred Seminals) had taken a long time to compile together, making havock of the neat Structures of Bodies.

Secondly, How unlikely it is for Water to be so disposed in the Earth; in what Vessels can it be imagined to lodg? Yea, how these fancied *Hydrophylacia* can be so well placed, as they may best be capable to receive the fires, from the as much fancied *Pyrophylacia*, without danger of the Waters falling upon the fires and quenching them, so as to make the heated *Hydrophylacia* the cause of Hot Baths; for cannot Water as easily descend or slip down those small Chinks and Cranies, and smother that Demigorgon, as the fire could ascend to heat these Cisterns of Water? unless we imagine the Water included in some vast Kettles, (and so was heated by the playing of the flames about) and then we must be forced to think of a *Vulcan* to be before his Fires; who must first hammer out these large Caldrons, preparing empty Vessels for us to fill with our watery conceits.

Thirdly, If we should grant the possibility of these actual Subterraneal Fires, as connatural to the Earth, why should we not find Minerals and Metals melted instead of being generated? and why we should not, where these fires meet with Vitriol and Nitre, or Vitriol and Salt, find store of *Aqua Fortis*? and meeting with Sulphur, should not give us plenty of Oil of Sulphur, *tanquam per campanam*, being the winding Crevices of the Earth would do the like as Glass Bells for condensing the Vapours of fired Sulphur into a Liquor, and meeting with Vitriol or Alom-stone, should not

calcine

calcine them to our hand; so as instead of Vitriol, we should find Colcothar; and instead of Antimony, we should find either *stibium* or *regulus*, or the sublim'd flowers; and so I could hold on to number up many more absurdities that would necessarily follow.

Fourthly, If we consider how easily combustible Concrets in the bowels of the Earth, where plenty of bituminous and sulphurous matter is found, may, and probably hath been kindled, either by Lightning, or by catching flame from some burning body; or lastly, by some of their Marcasites, expos'd to the moist Air, or to whom a moist Air hath had access; for being once fired, *vires acquirit eundo*, it burns on as long as it finds Fuel; and where store of combustible matter is, (as without doubt there is in all the *Vulcano's*) there cannot but be plenty of Hetetogeneous mixtures, as of Stone, Gravel, Earth, *&c.* which together with the combustible matter, is thrown up at the mouths of those subterraneous Furnaces; which if they (as by continuance of time) may by constant burning so undermine the ground, as at some times a vast quantity of Earth and other Rubbish fall upon it; then being forc't to seek another passage forth, and cannot suddenly, or at least, not so much as the force of the fire requires, it being obstructed in its passage, causeth Earthquakes; but at last finding vent, makes new Eruptions, thrown forth in such abundance of Stones and Earth, as sometimes is sufficient (if it happen under the Sea) to make a new Island; witness what *Kircher* reports hapned, *Anno.* 1638. *ad insulam Sti.* Michaelis *in* Mari Athlantico, *Stimulantibus ignibus subterraneis tantum lapidum in medio Maris egestum*

Kirch. Mund. Subter. pag. 77.

gestum fuit, ut inde insula lapidibus in montes ex-
tervatis nata, sese ad quinque milliarium latitudi-
nem extenderit: As also in *Agro Puteolano, Novus*
mons ex Mari, unius noctis sævientis naturæ subter-
ranea violentia protuberans; also, *Vulcanus Liparitanus* (he further adds) *Tantum cinerum saxorum-*
que ante annos circiter sexaginta (speaking from the time his Book was writ) *ejecisse fertur; ut juxta*
sese in medio Mari, quem & ideò vulcanellum, veluti filium a patre genitum vocant, produxerit; which he confirms by his own Observation.

And to confirm further what we say concerning the occasional or accidental inkindling of combustible matter, in the intrals of the Earth, I shall call in a Testimonial Instance, out of Mr. *Burton*'s History of *Leicestershire*, who saith, "That at *Coal-*
"*Eaton* in that County, in the beginning of the
"Reign of King *Henry* the Eighth, the Coal-
"Mines there did burn for many years together,
"and could not be quenched, until the sulphurous
"and brimstony matter (whereupon it wrought)
"was utterly exhausted and consumed. The like fire in Coal-Mines, was in the year 1622. burning near *Willingsworth* and *Weddesbury*, in the County of *Stafford*; not unlike which was a sudden eruption of fire in the Coal-Mines at *Sunderland*, in the County of *Durham*, (as I was informed by my learned Friend Mr. *J. H.* who had it confirmed by a Gentleman of that County, who had been Page to King *James*) where by a sudden eruption of fire, to the number of about five persons working in the bottom of the Pit, were consumed and destroyed; several of their Members, as Arms, Legs, *&c.* were found torn from their bodies.

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The laſt inſtance might be a ſulphureous Damp, or arſenical malignant Steam, ariſing from the commixture of heterogeneal mineral Juyces or Spirits, which by the flame of a Candle (which the Miners frequently have to work by day and night) might very probably take fire, and ſo by its unimaginable force, might eaſily act that Tragical Scene.

The other Inſtances evidence the poſſibility of Subterraneal Fires from occaſional and accidental Cauſes, which may, not unlikely, be transferred (I mean from the like cauſes) to thoſe Ignivomous Mountains, *Ætna*, *Veſuvius*, *Strongilo*, &c. So that as a Subterraneal Fire was inkindled in Coal-Mines, which continued for many years; during which time it was as real ſubterraneal Fire (and as probable from the ſame cauſes) as thoſe fired Mountains aforeſaid.

Only the main Objection I meet with, is the perpetuation of thoſe bituminous and ſulphurous Fires of the flaming Furnaces of *Ætna*, *Veſuvius*, &c. which thoſe other fires in coal-mines do not; therefore, as ſome ſuppoſe, are fed by a large Central or Abyſſal Fire; witneſs *Kircher*, *Abyſſorum omnium pyrophylacticarum maximam ſancti patres in centro terræ non incongrue ſtatuerint, æternum improbis ad pœnam deſtinatum carcerem*: which (as he ſuppoſeth) is no leſs then Hell Fire, and the Confines thereof to be his other *Pyrophylacia*, which heat the *Hydrophylacia*, and gives Original to all Hot Baths: which being a figment from the Center to the Circumference, from the beginning to the end, I ſhall not take ſo much liberty now as to inſiſt upon it.

The Reaſon, I would ſay, why the Vulcano's are kept burning with a perpetual Fire, is the vaſt quantities of bituminous and ſulphureous matter

lodg'd in those great Hills; which having once taken fire, burn on, and then comes about in a great round; and as it hath consumed the combustible matter on one side, it goes further on to consume the other; which whilst it's doing, that vacant part retaining yet (especially in the Earth thereabouts) the Seeds of those sulphurous mineral Concretes, produceth the like *de novo*, wch becomes fresh Fuel when the Fire wheels about again, still the Mineral Seeds being at work, produceth fresh Minerals in the deserted spaces, where the Earth yet retains the seminal Juyces of those combustible Bodies; and thus may the Circle of those Subterraneal Fires be perpetuated, and not fed from any Central or Hell Fire implanted in the Earth; which may well be confirmed, in as much as it is observed, that Minerals and Metals are generated anew in the same places out of which they have been formerly digged; witness the profit (*Falopius* saith) the Duke of *Florence* hath by it; and what *Sandiv.* saith, That there have been Metals found in Mountains, where formerly there have been none left.

Thus not onely Nitre is afresh to be got out of the same Earth it was formerly extracted from; but the like is observed in the Minerals of Vitriol and Alom; yea, the Generation of Metals, are not terminated with one production, it ceaseth not there, but the Mineral Seed gathereth strength by inlarging it self, continually proceeds to subjugate more matter under its Government; so as where once a Generation is begun, it continues many Ages, and seldom gives over: Thus Dr. *Jordan* hath observed from the Tinners in *Cornwall*, That they have, after thirty years, found Tin generated *de novo*, where it hath been formerly all digged up and filled with Earth.

Earth. The like hath been observed of Iron, in the Mines of *Ilva*, an Island in the *Adriatick Sea*, under the *Venetians*, where the Iron breeds continually as fast as they can work it, which is confirmed by *Agricola* and *Baccius*. The like at *Saga* in *Ligiis*, where they (as the same Dr. *Jordan* observeth) dig again their Iron-Mines every tenth year. *Mothesius* gives examples of almost all sorts of Minerals and Metals, which he hath observed to grow and regenerate. *Erastus* (as Dr. *J.* notes) affirms that he saw in *S. Joachims* Dale, Silver grown upon a Beam of Wood, which was placed in the Pit to support the works. The like of reproductions of Metals, is also observed in the Lead-Mines at *Mendip* and the *Peak*, which do not only stretch further in extent of ground, then hath been observed heretofore, but also are renewed in the same ground which hath been formerly wrought. But to return.

Now as these Subterraneal Fires are not (for reasons aforesaid) native to the Earth, nor are Elementary *in Centro Terræ*, more then *sub Concavo Lunæ*; so consequently, neither are they causes in general of our Hot Baths, or sulphureous Springs; for as there are no Subterraneal Fires found either near our Hot-Baths, or our Sulphur Waters; witness the digging to the Source of a hot Water, by the charge and industry of *M. de Rochas*, (which in our *Hydrol. Chym.* we further insist upon) where the Earth was digged beyond the original of the Waters heating, and yet not the least *specimen* of any actual or Elementary Fire, being only produced from a vivid nitrous or hermetick Salt, (as he calls it) frequently ingendred *de novo*, touching upon a Mineral Bed of *Sulphur Vive*, from whose mutual

contact that Hot Bath proceeded: Nay, beſides this, ſuppoſe we ſhould (for indulgence ſake) admit of a Central or Elementary Subterraneal Fire, keept burning by a ſulphureous Matter, yet would it not even hence follow that our hot Baths or ſulphureous Matters, ſhould frequently have their original thence; and that, firſt, becauſe ſuppoſe Sulphur burning actually, and that whether ſet on fire by any of the aforeſaid cauſes, or by Central Fire, or as you will, yet ſhall this Sulphur heat no further then the inkindled flames reach, no more then Sulphur burning under a Glaſs Campane, (for the making its Oyl) doth heat further then the Glaſs it toucheth, ſo that the actual flame heats, but ſo doth not the fume thereof; for, ſuppoſe that the actual flames of Sulphur ſhould touch upon, and heat the Water; why might we not as eaſily imagine the Water to quench the Fire, as the Fire to heat the Water? Nay further, Suppoſe we ſhould grant that the flame ſhould not heat Water immediately, but mediately by heating other bodies, as Stones, *&c.* over which the Water *in cuniculis propriis* paſſeth, according to *Falopius*, yet not a few abſurdities would hence follow; as how theſe flames ſhould burn under a Quarry of Stones, when thereby intercepted from Air (the life of Fire) without which it exiſts not? Next, how theſe hot Baths ſhould then become impregnated with the medicinal vertues of Sulphur, ſeeing, by this Suppoſition, the Water would want both the flame and fume of Sulphur?

My ſecond Reaſon (why upon admiſſion, that though a flagrable ſulphurous matter ſhould be burning in the bowels of the Earth, yet ſhould it not be the cauſe of hot Baths) is, becauſe then generally all

all hot Waters would have a ſtrong Brimſtone-like ſmell, like the odor of Wine or Ale matched or fumed with Brimſtone in Bottles, or like the fumes of Sulphur which ariſe in the diſtillation of its Oil *per campanam*, of which ſmell, amongſt all hot Baths, I read of none which yeeld it.

My third Argument is grounded upon matter of fact in this following Experiment, (*viz.*) Take a mineral Sulphur, whether *Vive*, or in a Marcaſite, (as of Vitriol *&c.*) put it (in pieces) in an Earthen Retort, and give degrees of fire under it, in a Furnace; where, becauſe the fire comes not actually to it, it flames not; urge this ſo, as all the Fumes (which are dry ones, called Flowers) ſhall paſs through the Neck into a Receiver, fill'd moſt-what with Water, & ſo placed, as that theſe fumes all fall and condenſe upon the ſurface of the Water; which they will do in an unctuous ſubſtance like Oil of Wax or Amber, congealing by degrees, and becoming harder, they fall down to the bottom in bright flakes of Brimſtone; by which way I have got a Sulphur out of the Marcaſites of Vitriol found in the Bog near the *Sulphur-Well*. Now the Fire (as I ſaid) drives forth the dry fumes or flowers; theſe coming in a vapor, condenſe upon the ſurface of the Water in the Receiver; and yet (which is what I aim at) this Water hath neither taſte nor ſmell like that of our Sulphur Well at *Knarsbrough*. So that neither an actual or immediate firing of Sulphur, as is done in the making its Oil, nor a diſtilling or ſubliming of it by a Fire *ab extra*, whereby Sulphur becomes ſeparated from a Vitrioline Marcaſite, will give to Water either the like taſte or odour with the *Sulphur-Well*; and therefore we muſt conclude, that its fætid odour, is not cauſed from any Va-

ports of burning Bitumen or Sulphur, whether imagined to be done in open passages, or close Caverns of the Earth.

Having thus far refuted (and that I hope demonstratively) the Opinions of Hot Baths and Sulphur Waters, taking their Original from imbred subterraneal Fires; I shall now propound my own Observation, in the fabrick of the like Waters, artificially performed in imitation of the natural. I tryed therefore whether *Sal Armoniack*, mixed with a Mineral Sulphur, and so dissolv'd together in a distilled Water, would at all open the body of Sulphur; into which, when filtred, I poured some Solution of Alom-stone; but it caused no precipitation, nor made any discovery of any dissolv'd Sulphur; also into a little of the clear Solution, I poured some Oil of Tartar *per deliquium*, and thereby found it raised a volatile Spirit out of the *Armoniack*, which would smite the Nose, but perceived not the least odor of Sulphur. So that I observed that neither *Sal marine* alone, or joyned with Nitre, nor *Sal Armoniack* (compounded of a *Sal marine* and Volatile Salts) would any of them be sufficient to open the body of Sulphur in its Mineral Marcasites.

At length, after various Experiments, I hit upon that which answered my expectation, and satisfied my curiosity; and for the further improvement of ingenuity, and as a Spur to the greater advancement of Mechanical Experiments, shall communicate that to the World, which all the Writers of those Sulphurous Waters (which I have yet met with) have been deficient in.

I took therefore a pint of Spring-water, in which I dissolv'd betwixt one and two dragms of *Sal marine*

rins in frigido; for about that quantity the Sulphur Water contains of common Salt; into which Solution of Salt, in Water, I added of *Calx Vive*, and the Marcasites of Vitriol, (found near the *Sulphur-Well*) grosly pulverised, about two or three ounces, which presently contracted a considerable heat; I poured off some of the Water, into which, filtred, I poured a little Solution of the simple Alom-Salt, and it immediately caused a precipitation of a Sulphur, and sent forth the very smell; yea, had the exact taste of the *Sulphur-Well*.

This Experiment, thus succeeding, gratified me for my pains in others less successful; for that which I long'd to know, was, What that *Menstruum* should be, which might so open the body of Sulphur in the Marcasites, as might render it capable of a precipitation or coagulation by another second *Menstruum* or Acid Liquor; seeing we could imagine no lixivial Salts could be found in the bowels of the Earth, (which commonly is used for the opening the body of Sulphur); Therefore I thought it might possibly be from some natural *Calx Vive*, seeing there are plenty of Lime-stones upon that Forrest, which at *Knarsbrough* are burnt in Pits; and so it proved, for the Salt-Water passing through some natural Stone, or soft Marcasite of *Calx Vive*, becomes acuated thereby; and then running over the Vitrioline Marcasites, or passing through a Sulphureous Earth, congeneal to those Marcasites, opens the body of their Embryonative Sulphur, which it carries along with it, till it come on further to an Alom-Bed. (which I observed to be within ten yards of the breaking forth of that *Spaw*) where the acid Juyce precipitates the Sulphur, and sends

forth the odour; which being percolated through a ſtreiner of Sand, comes forth pretty clear.

That this Artificial Water is an exact reſemblance and imitation of the natural, is evident, becauſe it anſwers the natural in every circumſtance; for it hath the very ſmell and taſte, undergoes the very ſame precipitations by lixivial Liquors; yea, and laſtly, tingeth Silver yellow, as readily as the *Sulphur-Well*; and therefore, without doubt, the Operation of the Artificial would be found (upon tryal) equivalent to the Natural in other properties alſo.

The main Objection that offers it ſelf againſt the identity or ſimilarneſs of this Artificial, with the Natural Sulphur Water, is by querying how *Calx Vive*, which is an artificial product of the Fire, actually calcining thoſe Lime-ſtones, ſhould be imagined to be naturally in the Earth, or how Nature ſhould find ſuch a Stone calcined to its hand, in the Entrals of the Earth, as may be ſufficient to open the body of theſe ſulphurous Marcaſites.

To which I Anſwer, That it's more then probable there is a natural ſoft Stone of *Calx Vive*, where this Marcaſite is *in ſucco primitivo*, retaining the ſame Seminals and eſſential Properties, in a remiſs degree, with that Stone brought on to maturity by Air and Fire; for the Air firſt hardens that Stone, (and makes it unfit to give any Solution in Water) and then the actual Fire looſneth it, and makes it yeeld it ſelf more readily to a Solution by moiſture.

To illuſtrate which, we can as eaſily apprehend that the Air doth harden theſe natural Lime-ſtones (which, while ſucculent, are ſoft, and in the form of a white Earth or Marl) by its continual acceſs

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in a long tract of time; as we can imagine the ſame Air to harden a blew Clay, found upon the Banks in *Lincolnſhire*; which being expoſed to the Air, doth, in continuance of time, harden into a ſort of Stone like a blew Marble. For Workmen generally obſerve, that all manner of Stone (yea even Marble it ſelf) which they dig out of the Ground, becomes more and more hard, by being long expoſed to the Air; which, to me, ſeems to give no ſmall grounds of reaſon for the poſſibility of the Liquor Alkaheſt, or Univerſal Solvent; for ſeeing all bodies are but concretions, and (as I may ſay) hardnings of their primitive Juyces, under various diſguiſes, generally performed by the efficiency of Air: Therefore to prepare a *Menſtruum* by Art, which may work wonders in this kind, is no more (as I apprehend) then to make ſuch a one as may ſoften theſe Concretions, (made by Air) and by taking away their hardneſs, may reduce bodies into their firſt jucy Liquors; for what is the ſhell of an Egg, but a ſoft film or membrane, hardned and petrified by the influence of the Air, and as eaſily reduceable into its firſt membranous ſoftneſs, by being boyled a while in Vinegar? What are the Bones of Animals, but Spermatick Juyces hardned and conſolidated? And were it not for the perpetual circulation of the Juyces of the body, conſtantly tranſpiring through the pores thereof, we ſhould either become petrified, and walk about like ſo many movable, but ſenſleſs Statues; or we ſhould be incircled with a Bark, and appear like ſo many Plant-Animals, or ſenſitive Plants. What are all Vegetables from the Hyſop or Roſemary of the Wall, to the talleſt Cedar, but ſeminal Juyces congealed into thoſe bulky ſubſtances which are preſented to

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our eye? Lastly, What are all Mineral and Metalline Marcasites, Stones, *&c.* but the primitive liquid succulencies concreted into more solid bodies by a hardning ferment (or what other name we may call it by) æquipollent to the Air?

And amongst all these, what are the Marcasites of Lime-stone, but a hardned concretion of its first imbred Juyce, or soft marly Earth? whose *Minera*, whilst thus *in solutis principiis*, is one of the chiefest Juyces in the Fabrick, both of hot Baths and sulphureous Waters.

That this is the chief cause of hot Baths, is confirmed by that Experiment made by that Noble Person, the Lord *Fairfax*, of a piece of a white Marcasite found about the place of those hot Springs in *Sommersetshire*, which put into Water, gives a heat; not but that there may be other causes of hot Waters, as from the coincidence of two Springs impregnated with different Mineral Salts and Juyces, which before union are probably both actually cold, and yet by a fermentation caused by their mutual contact, may cause a considerable heat; which can no better be resembled, then by supposing a current of Water, indued with a lix vial or volatile Salt, to meet another saturated with an esurine acid Spirit or Salt; though these before union are both actually cold, yet forthwith, upon their mutual contact, they make a strong ebullition and fermentation, which produceth a heat sufficient to warm those Liquors, which are, or pass through where the contest is made; not to say that an other cause of some hot Baths, may be from some Marcasites contracting a heat by moisture, let into their *Minera* by some crevices of the Earth, which may give heat to some Springs that pass over them, nor

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to insist upon any other cause (*viz.*) of some Salts, which in the *Minera* of Sulphur, may cause such a fermentation, as may cause hot Springs; witness Dr. *Roch.* his Experiment.

Yea, that this natural Lime-stone may be reckoned amongst the chief causes of hot Baths, is further confirmed by a lixivial Salt, (though small in quantity) which I have, by evaporation of *Buxton* hot Water, found left behind: that it is an alkalizate or lixivial Salt, appears both by its salty taste, its easie solution *per deliquium*; and lastly, The Ebullition it makes with an acid Spirit; all which are demonstrative Arguments of its alkalizate nature: for *Buxton* Bath consists of Water, which by distillation ariseth insipid over the Helm, and therefore contains no volatile Minerals, and of an inconsiderable quantity of a solution of the Alkali of the natural Lime-stone, (where plenty of the Lime-stone hardned by the Air, is found in the Countrey thereabouts).

And that this *Minera* of *Calx Vive*, is the chief (if not the sole) apperient, that opens the body of Sulphur in its *Minera*, for the making sulphurous Waters, is evident from our lately proposed Experiment; for all sulphureous Waters (as I hinted before) are either such as have a sulphureous or bituminous matter swimming upon them, (witness the instance aforesaid) or they are such whose bodies being opened by proper Solvents, do then easily give forth their volatile odors and sapors to Water, which may be made evident by the addition of acid Salt or Liquor.

And now that we have found out what the first Menstruum is, which opens the body of Sulphur in the Marcasites found near the Sulphur-Well; Let

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us now consider what these Marcasites are, I find them to be a spongy or porous Stone, hard, and wrought with a kind of Net-work, which in it self contains both Vitriol and Sulphur, besides a body of Colcothar; and that it doth so, appears by exposing some of these Marcasites to the Air, till they be covered with a hoary sweet vitrioline Flosculе, which then being washed, gives a vitrioline Solution, that being filtred and evaporated to a cuticle, shoots into a green Vitriol.

These Marcasites, thus washed, we set before the fire to dry so long, till they began to send forth a sulphurous fume; then being pounded grosly, we distilled, or rather sublimed them in an Earthen Retort; what would arise by degrees of fire, we so placed a Receiver, with Water in it, as that the fumes were thrown upon the surface thereof, which first swam like Oil upon the Water, then by degrees hardening, fell down to the bottom; which when the sublimation was over, we washed, dryed, and then melted it, and in small lead Pipes cast it into Magdaleons; in colour and inflammabity, exactly resembling the common Sulphur, of which at one distillation I got near half a pound.

That they contain a Colcothar or Metalline *Crocus*, is evident, by burning the Sulphur of one of these Stones in the fire; and when cold, it will be red just like the Colcothar of the Vitriol of Iron.

The *Caput Mortuum*, left after the sublimation of the Sulphur from the Marcasites, is very like those Cinders, or *Scoria* of Iron, which is melted from the Iron-Mass in the Forge, where Iron is made out of its *Minera*.

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From what hath been already ſaid, there ſeems to be no ſmall incouragement towards proſecuting a further diſcovery of the nature of this Water, by digging the Spring, and following it to the ſource, or original, where it receives the firſt impregnation with Sulphur; for I ſee nothing yet to the contrary, that may perſwade, why it ſhould not be found to be a hot Spring at that place where the firſt imbibition of Sulphur is, eſpecially if the *ſuccus Lapidis calcari*, or *Minera* of *Calx Vive* be found with it, which (for ought I know) might be found equivalent in vertue to the *Aqua Aponenſis*, that famed hot Bath near *Padua*, ſo much diſcourſed by *Falopius*, whom I find to enumerate the very ſame mineral Ingredients, in that which I find by Experiment aforeſaid to be in ours, before its precipitation by an aluminous acid Juyce; for he ſaith, *Certò collegi illa tantum tria (i. e) Sal copioſum, ſuccum lapidis calcarii, & vaporem ſulphureum in illâ Aponenſi aquâ conteneri*; and ſaith further, *Eſt aqua ferventiſſima, & dum calida eſt, ſapit ſulphur & bitumen, refrigerata neutrum per ſe fert*; and ſpeaking on of hot Waters, ſaith, *Aquæ Thermales quæ actu frigidæ ſcatent, in ſuâ origine eſſe ferventes*; and that onely happens from the diſtance of ſpace betwixt the impregnation of Waters firſt with their Minerals, and their place of breaking forth.

And as Dr. *Jordan* ſaith, That all hot Waters are not Sulphurous, witneſs the Baths of *Caldenella* and *Avenian*, *&c.* which are all hot, and yet give no ſign of Sulphur, proceeding rather from the *Minera* of *Calx Vive*, or from other the like cauſes of hot Waters, as aforeſaid; nor are all ſulphurous Waters hot, and that becauſe of the diſtance of the

Minera,

Minera, where the Water first receives heat from the eruption of the Spring-head.

Amongst these sulphurous Springs, as some are replenished with a common Fossil Salt; witness the *Sulphur-Well* we discourse of: So there are found others no less sulphurous in taste and smell, which yet have not the least *specimen* of any such Salt; for instance, One of the Springs which is in the black Bog, where the Marcasites are got; and one at *Braughton*, not far from *Skipton* in *Craven*; as also one I found in *Ferndale* upon *Blacomore*; all which are caused by a combination of a mineral Sulphur and a natural Lime-stone, the one opening the body of the other, without the addition of any common Salt; onely these Springs having imbibed these Minerals, meeting afterwards with an acid Juyce of the Alom-Salt, make a precipitation of the body of Sulphur, and onely leaves the Water perfumed with the odor thereof.

That this Sulphur Water should coagulate Milk, if boyled therewith, proceeds from a sleight touch of the acid Juyce of Alom; which although in the coagulation of the Sulphur, it also precipitates a great part of its own body, yet so much thereof remains, as doth make it capable of curdling Milk; for the Sulphur doth not, in as much as it retains that coagulating property, after the sulphurous odour being evaporated; yea, the very Salt left after distillation or evaporation will do the same; nor may the common Salt, (the chief Ingredient of that Water) do it, because we see the contrary in putting Salt to Water and Milk, which doth not curdle it; therefore it must be from some small imbibition of the Alom-Salt, which yet is so little in quan-

quantity, as doth not alter the cubical figure of the common Salt.

And to try whether we could ſeparate the common Salt, from the body of the Sulphur Water, and the Water only to retain the odour thereof; I took of the ſandy Earth, which lies upon the Bank oppoſite to the Well; wherewith I cauſed a tap'd Veſſel to be filled, upon which I ordered the Sulphur Water to be poured; and about two hours and a half after, (during which time I was digging in the Bog above) I cauſed ſome of it to be let forth at the Tap into a Glaſs, and found its brackiſhneſs not only much diminiſhed, but that alſo it loſt its ſulphurous odor quite, having not the leaſt ſmell or taſte thereof.

From which experiment may probably be confirmed theſe two Suppoſitions; firſt, That the breaking forth of this Spring, is not far from the place of its imbibed Minerals; for although it be ſo far, as the firſt contracted heat is loſt in its paſſage, yet it's not ſo far, but that it retains its odor after the precipitation of the moſt part of the Sulphur, by the acid aluminous Juyce. Next, That if this Sulphur Water had been carried through a longer tract of a ſuppoſed Strainer, before its eruption, it would not only have been diminiſhed in its Salt, but alſo its ſulphurous odor would have been very weak, if not wholly ſpent.

That the Earth, about the Sulphur Well, is repleniſhed with variety of Mineral Glebes, is evident from the diverſity of Waters found thereabouts; for near the Sulphur-Well, there is not more then ten or twelve yards diſtant, (upon the Banck on the other ſide of the current of Water) a Spring which drills out of a ſmall Alom Rock, which

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leaves a red Sediment behind it, and runs forth with so great a disadvantage, as to the saving any of it clear, that I could not (that little time I had to stay) procure any clear Water to make tryal thereof, but it promiseth much for an Alom *Spaw*.

And in the black Bog, about two hundred and forty yards above the head of this Well, where the Marcasites are chiefly found, are several slow Springs, all which I have caused to be digged further; that which lies on the North side of the Bog, is that which the Water-women call (improperly) an *Alom-Water*; this, with a little Gall, strikes a deep purple, and in taste is very strong of the Vitrioline Marcasites; yea, the most of the Earth digged up, is Vitrioline.

That Spring towards the West, hath a both sulphurous odor and taste also, but not very brackish; this I caused to be digged a little depth, to find out the Marcasites; where we found many little metalline Stones, perforated and corroded into Shells or Scales, and worn (as I may say) into Seeletons: I found in the Earth, lying along the current of the Spring, a bright Floscule, which runs in streaks very thin, and almost impalpable; which lay much in Veins; I look upon it as a crude mercurial Juyce, which with its connate embryonative Sulphur, was as a Seed, laying a foundation for a mineral or metalline production; the Spring, by digging, proved more large and fluent; the Earth about it, was a black soft marly Ground, very unctuous, and appeared as if it were much impregnated with Mineral Juyces; the Earth grained, dryed, and burnt, gives a Brimstone-like smell. Those Marcasites we found, were below the current of

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the Spring; and therefore it's likely that Water had not penetrated them, for it gave no tincture with Galls.

The Spring towards the South, had plenty of a black ſpongy Marcaſite, out of which we took ſeveral pieces; yea, all about that place is full thereof round about the ſides, and in one place, where the Air had wrought upon the Marcaſite, it did ſhoot, by the heat of the Sun, into green Chryſtals like Vitriol; as indeed being nothing but Vitriol it ſelf, of which I have ſome by me: The Water that ſtagnates there (for it hath no current) will with Galls give a deep purple tincture, being very acid in taſte, and ſo undergoes the other mutation of colours like other Vitrioline Waters.

And now I have ſhown, how Mineral Juyces, by their coincidence and mutual contact, with their various fermentations, become the original efficients of Hot Baths and Sulphurous Waters, in the ſecret Meanders of the Earth, where Metals and Minerals are *in ſolutis principiis*, in their primitive ſpermatick Juyces, from whence proceeds the great variety of taſtes, ſmells, alterations of colours, fermentations, and different operations of all Mineral Waters; and as theſe are the true cauſes, from whence the moſt natural *Phænomena* of Concrets, peculiarly belonging to the Mineral Kingdom, are deducible; ſo in like manner, the various fermental Juyces, which circulate in the Channels of the bodies of Animals and Vegetables, are the cauſes of thoſe manifold *Phænomena*, proper and incident to all Concrets belonging thereto.

For what is Heat, Fermentation, Motion, Nutrition, *&c.* with all the concomitants thereof, but products from the coincidence and combination of

Seminal, with adventitious Juyces of the bodies of Animals? What are the Juyces of the Body, undergoing various fermentations, but such as thereby are made capable (by a natural symetry) of performing the functions of Life? And what are the acid Juyces, scituate in their proper places, but actual Ferments, which macerate, prepare, dissolve, and digest the food we take in; which being altered by its passage through other subsequent ferments, undergoes various transmutations and diversifications, which succeeding in a constant circulation, upholds the fabrick of the body? Doth not the natural heat of the body, proceed from a due fermentation of the Juyces? as when the nutritive Juyce undergoes such alterations, by prævious preparations; as when in the form of a milky Liquor, it coincides with the blood in the subclavial Vessels; and both carried by the *Vena Cava* into the Heart, doth there strike up a vital heat in the taper of life, (the vital Spirits) but if it come raw, for want of a due preparation, by a defect of previous ferments, then it produceth a spurious febrile heat, which rather dissipates the natural heat, and destroyes (then binds up) the right tone and texture of the parts. And lastly, Doth not the acid Juyce of the first digestion of the Stomach, dissolve (loosening the *Viaculum* of) our nutritive Juyce, and so open the body thereof, as to make it become one similar milky Cremor? and doth not this dissolv'd and opened Chyle, receive a second *Menstruum* coming from the Gaul (that Balsam of the Body) by the *ductus communis*, inserted into the *duodenum*, and there (besides the peristaltick motion it gives to the intestines) in part precipitates the opened body of the Sulphur of the nutritive Juyce, and causeth a

volatile

volatile fætid flatus peculiar to those parts, which not finding vent *per inferiora*, sometimes works into the Stomach, and (by the mediation of the Nerves of the sixth conjugation) into the Head, and other parts; is not this fætid flatus (native to the intestines) caused by a commixture of a saline Ferment dismis'd (I say) from the Gaul, which precipitates the opened body of the Sulphur in our nutritive Juyce, which before such precipitation, is a similar Cremor?

And to conclude; is not the growth, budding, bearing, and specifical endowments of Vegetables, the product of fermenting Juyces? And is not the changing of Fruits by grafting and inoculating one sort into another (as that a pleasant Apple should grow from a Crab-stock, and a Pear from a Thorn) caused otherwise then by different fermentations, and specifications of the nutritive Juyce, which no sooner undergoes any different ferments, or passeth various Strainers, but forthwith becomes metamorphosed thereby; so that the metastasis of all bodies in the whole triplicity of nature, depends upon the variety of fermenting Juyces, and their mutual complications, implanted in the Seminal Principles of all Concretes.

But to return, to treat a little of another Ingredient of this Well, and that is *Sal marine*, or Fossil Salt, both are one, that of the Sea having its original (according to all probability) from Fossil Salt; concerning which, I find my Antagonist, *p.* 119. 122. of his *Mimick*, about to impeach me of two Contradictions; the first is, in that I say, The saltness of the Sea proceeds from Fossil Salt, which being dissolv'd in Water, is carried into the Ocean, and yet maintains a circulation of the Sea-Water,

from the Sea, to the heads of Springs by Subterraneal Channels: Now the force of the Contradiction, as he supposeth, lieth in this; that he imagineth, that I would assert that the same Channels should convey a Salt into the Sea, and also convey the Sea-Water to the Springs, two contrary Currents in the same Channels.

To which I answer, That there is no need (in that Hypothesis of the Springs, having their original from the Sea, and the Sea's having its saltness from the Earth) to assert two contrary Currents in the same Channels; and that, first, because of some Rocks and Bodies of Salt which are often found in the Sea; and next, because of the saltness, dispersed throughout the whole body of the Earth, easily imbibed by Waters, (as the Learned Dr. *Highmore* notes upon the Controversie, *Philosophical Transactions*, *Numb.* 56. *P.* 1129, *&c.*) and may as easily be conveighed into the Sea by Subterraneal Channels, passing through Salt Beds, in their passage from one Sea to another; which Subterraneal Channels (by which Seas communicate) we have demonstratively illustrated in the Appendix to our *Hydrol. Chym.* p. 307, *&c.*

But I find my Antagonist taking sanctuary at his wonted Asylum of Putationary Philosophy, comming in with his, I do verily think that all the Fossil Salt in the body of the Earth, (which we see is very rarely found) if it were dissolved, would not serve to supply a twentieth part of the Salt that is in the Sea; whom I answer, That surely he is either ignorant, or at least oblivious of what is writ concerning Rocks of Salt in *Bohemia*, in *Monte Carpato*, in *Polonia*, within two miles of *Cracovia*, in *Helvetia* and *Rhetia*, where they have no other

Salt

Salt but from the Rock; as also by the *Caspian* Straights are great Rocks of Salt; there are also many Rivers of Salt Water by the *Caspian* Straights, and in *Spain*, and *Caria*, and in *Bactria*, *Ochus* and *Oxius*; also there are Salt Lakes, as the *Tarentine* Lakes in *Italy*, the Lake between *Strapela* and *Seburg*; in *Germany* three Lakes; in *Sicily*, (and besides an infinite number in other Countries) the Lake of Lakes, the Sea, all which (as Dr. *Forden* saith) receive their saltness from Mines of Salt in the Earth, which are very frequent and huge in bigness, as may appear by the foresaid Rocks of Salt; Yea, *Marcus Paulus Venetus* tells of a Rock or Mountain of Salt in *Thaican*, able to furnish all the World with Salt: So that it is no marvel (saith the ingenious Dr. *Forden*) that the Sea is salt, seeing it pierceth into the bowels of the Earth, and discovereth many great Rocks of Salt which dissolve in it; and this is the true cause (saith he) of the saltness of the Sea. What is premised, will be sufficient (without any more adoe) to take off his accusation of a second Contradiction, (*p.* 122.) in that I say, in one place the *Sulphur-Well* at *Knaresbrough* is saturated from Fossil Salt; and in another place, that *Sal marine* is the cause of that Sulphureous Spring, seeing it is evident (as also witnesseth the learned Dr. *Highmore*) that the Salt of Sea-Water and Salt-Springs are the same with Fossil Salt; his objection against the Seas having its saltness from Fossil Salt, is frivolous, (*viz.*) That it should (if made by Fossil Salt) kill all Fish, as well Sea-Fish as Fresh-Fish; for so (saith he) Salt put to fresh Water doth; which is even as true, as that Fish should, being kept over-night in a clean Copper Vessel with the Water they swim in, be found dead the next

morning, by the mortal Steam or Vapour of the Copper; both which are found false by matter of fact, the one by that Experiment I made of Fish, which not only out-lived one, but two nights in a Brass Pan; the other by that Experiment of Oysters made by Dr. *Highmore*.

I shall now conclude with the addition of a few Mechanical Experiments made upon this *Sulphur-Water*, thus:

First, It takes no purple or red tincture from infused Galls, as having nothing of the præcipitable parts of Vitriol or Alom; Oil of Tartar being added, it becomes muddied into a white curdled Liquor; and with Oil of Vitriol, or Oil of Sulphur, it becomes clear again; but with fresh Oil of Tartar, it is presently turn'd to a colour inclining to a red; and with the addition of more Oil of Vitriol, or such like, it becomes transparent, and of the colour of Sack, or English Beer.

If upon fresh Sulphur-Water, Oil of Vitriol be poured, it makes neither a precipitation, nor any other alteration, and that because of a prævious saturation with an aluminous acidity; but by adding Oil of Tartar thereunto, and after that Galls, then follows an effervescence, and it becomes of a reddish colour.

Lastly, By the addition of Oil of Tartar, this Sulphur-Water turns white, and that because it is impregnated with a small quantity of the simple natural Alom-Salt.

A return to some Reflections and Queries, made on the enlarged account of my Antagonists Answer to Hydrologia Chymica, *in the Philosophical Transactions of the* Royal Society, Numb. 51. *chiefly concerning the cause of the sudden loss of the Vertues of Mineral-Waters; by the Learned Dr.* Daniel Foot.

Philosoph. Transact. Numb. 52. *p.* 1050.

THE Ingenious Publisher of the *Philosophical Transactions*, in his enlarged account of my Antagonists Answer, hath these words, *viz.* That these (meaning *Scarbrough*) Waters lose all their Vertues, yea, their quantity and bulk also, though in Glasses, and under the Hermetick Seal, if removed from the Fountain Head; and then they become suddenly putrid, ill-coloured, losing their taste and scent, *&c.* doubtless through the loss of the Volatile Spirits. What ever (saith he further) these Spirits be, that will neither indure to travel from the place, nor will be confined in any Bottle, nor under any Seal, *&c.*

So that the sum of his conjecture (as the Doctor concludes, *p.* 1051.) is, That this loss consists in

the avolation of some most subtil and penetrating spirituous parts, not to be imprisoned by any inclosure imaginable, but will find their way out, and leave the Waters bereaft of vertue, and decreased in quantity too; and (what is more) perhaps of their weight also, especially if they lose of their quantity.

Now to evince whether this be a conjecture, or no, and to clear up this point of Philosophy, in the Mineral *Hydrologia*, which hath gravelled many Writers, yea, made them run ashore, or to cast Anchor in shallow Fords, for want of a depth in Mechanical Experiments. This ingenious Doctor hath proposed these following Queries.

First, *Whether by Chymical Researchers, it was ever yet, or can be found, that such Waters, as the above-said, ever yeelded a vinous or an acid, or any other sort of Spirits, that was either inflammable or uninflammable, or flying over the Helm from the fire?*

Secondly, *Whether all those sorts of Water, when they are most closely stopt up, and so let stand, or conveyed to some distance, do not let fall a Sediment (most commonly) yellowish, or of some such colour, when they are become effete in their Vertues?*

Thirdly, *Whether when they are let stand onely, and not moved by carriage, they do not sooner become castrated, and sooner precipitate an Ocre to the bottom?*

Fourthly, *Whether such an Ocre is not found in all their Spring-heads and Streams also, but more in the Head than in the Streams, especially if issued therefrom to a good distance?*

Fifthly, *Whether it may not be found upon due observation, that two Bottles of the said Waters, whereof the one being industriously stopped, the other left unstopt, and both equally permitted to stand still,*

or equally moved, will not easily lose their Vertues Medical, in the same space of time, and have the same precipitated Sediment, and be of the same taste, colour, and a like diminished in quantity, with divers such like Circumstances?

Sixthly, *Whether two Vessels diversified in their matter, &c. filled with such Waters, will not yeeld the like Phænomena in all circumstances, as in the fifth Query are mentioned?*

Seventhly, *Whether it may be devised, how to prevent all precipitation of a Sediment in the Waters vessell'd up? and then to observe thereupon whether their Vertues would not be kept entire during such a prevention?*

Eighthly, *Whether any Observer ever found the Waters enervated, but found withal an Ocre let fall to the bottom, or sides of the containing Vessel?*

Ninthly, *Whether the Phænomenon of loss of vertues in such Waters may by an Hypothesis of an intestine precipitation of their parts, wherein those Vertues consisted, be as well (if not better) explicated, than by the Hypothesis of an avolation of spirituous parts through all Vessels and Closures whatsoever?*

These Queries I shall (by the help of a few Experiments) indeavour to resolve. As to the first therefore I conclude in the Negative, for I have distilled the *Spaw-Waters* of *Scarbrough* and *Malton*; the *Sweet* as well as the *Sulphur-Water* at *Knaresbrough*, *&c.* none of which ever did yeeld either a vinous or acid, or any other sort of Spirits that are either inflammable or uninflammable.

To the second I answer in the Affirmative, as to the first part thereof; to confirm which, and to illustrate the rest of the Queries with the light of truth, I shall propound two or three considerable Experiments. First,

First, Therefore I adviſed my ingenious Friend to ſet by a certain quantity of *Scarbrough-Spaw-Water*, in an open Veſſel, and found thereby that it did precipitate its Earth or Sediment in about forty eight hours, ſo that it would not give a tincture with Galls.

Secondly, Another quantity of *Spaw-Water* being ſet by at the ſame time with the former, but in a Glaſs Bottle ſo cloſe ſtopt, that neither Air could come in, nor ought evaporate; and being opened, when the other ceaſed to give a tincture, this did yet ſtrike a tincture, but within leſs then twelve hours after, it alſo would give none.

Thirdly, A Glaſs Bottle, and an Egg-Glaſs, being filled with the *Spaw-Water*, the firſt exactly ſtopt, the other hermetically ſealed, being both exactly weighed and ſet by, with an other Glaſs filled and weighed, but unſtopt, at the end of ſix weeks, the ſtopt Bottle could not be diſcerned to be heavier or lighter, being weighed again after the foreſaid time; nor could it be perceived that any Sediment was fallen, becauſe it gave as perfect a tincture with Galls, as Water freſh from the *Spaw*.

By which it appears, that the ſecond Query is thus far true, *viz.* That theſe Mineral Waters, when moſt cloſely ſtopt, and ſo let ſtand, do not let fall a Sediment; but if they do let fall their Ocre to the bottom, (as in open Glaſſes we find they do) then is this Sediment moſt-what of a yellow colour, and the Waters become effæte, as to their ſolutive Operations.

The third is anſwered in the Negative; for being let ſtand, and not moved by carriage, they do not (ſuppoſing they be ſtopt) ſooner precipitate an Ocre

to

to the bottom, nor sooner become castrated thereby; witness the third Experiment, where, in a stopt Glass, after six weeks time, no Sediment was fallen.

The fourth Query is found true in the Affirmative, by the common Observations of those who view varieties of *Spaws*, for they precipitate their Ocre both at the Spring-head, as also in their Current (for some distance) *sub dio*, but chiefly at the Spring-head; for whilst they are kept from the open Air, though their Channels under-ground should be stretched out much longer, yet would they not let fall their Sediment; by which it appears how great an influence the open Air hath upon the texture of Mineral-Waters, as well as upon other Bodies.

The fifth Query is solv'd by our Experiments thus, *viz.* That two Bottles of the said Water, whereof the one being industriously stopped, the other left unstopt, and both equally permitted to stand still, do not equally lose their vertues medical, in the same space of time, nor have the same precipitated Sediment, and consequently are not of the same taste, colour, nor alike diminisht in quantity.

The sixth Query is involv'd in the fifth, only presupposing that the stopt Vessel be of such a figuration or texture of parts, as may exclude the ambient Air, and then all succeeds as in the fifth.

The seventh is solv'd thus, *viz.* That these Waters being closed up either in Glasses exactly stopt, or hermetically sealed, and kept from motion, do prevent all precipitation of a Sediment in the Water; and this is confirmed by the third Experiment, where the Water was kept, hermetically sealed, for six weeks, without any precipitation; yea, the same is confirmed not onely in these Mineral Medicinal

Waters,

Waters, but even in more ordinary Spring-Waters, whose Sediments, or what else they have imbibed of Mineral Earth, will easily precipitate, by being exposed in open Vessels to the Air, or by being distilled, will leave behind their Sediments; whereas I found the very same, taken fresh from the Fountain, which I have kept hermetically sealed for above three months, not to give any the least precipitation or alteration of colour, which (for ought I know) may not only keep so unaltered for months, but also for years; which very experiment is not inconsiderable towards a further improvement of Philosophy, and amongst other Phænomena, which I shall not now take time to insist upon; that of blood extravasated by Phlebotomy, and a while exposed in open Vessels to the Air, doth receive no final alteration therefrom, making it separate into such heterogenious parts, as are not pre-existent in it, whilst running in the Vessels, and therefore doth not a little deceive those Physitians who judge of the temperature of the Blood, and of the predominancy of this or the other Humour, from a prospect of the extravasated Blood, separated by an exotick ferment of the Air, into Water, Phlegm, or white Gelly, or black congealed Blood; when (perhaps) that Blood, whilst in the Body, and (as I may say) hermetically sealed up in the natural Vessels, was similar in its parts; which (if enlivened with due fermentations and separations in the Organical Parts) would throw off all Scorbutick, Venereal, or other Miasms and Impurities, and circulate in the form of a pure homogenial rubicund Juyce: to confirm which, I would propound one or two Queries, the resolution of which will infallibly put the matter beyond dispute, *viz.* Whether

suppose

suppose some few ounces of blood should be taken from a sound (or if you will, from an unhealthful) Person, and by a Silver Syphon be conveyed part into a clean Glass, first warmed, and whilst warm, be sealed up hermetically, and so set in a continued gentle heat; whilst presently an other part of the same is conveyed, in like manner, into a cold Glass, and so presently sealed up as aforesaid, but set by in a cold place; whether, I say, hereby it will be found, that the blood (in one, or both, or neither) will keep its pristine form it had, whilst circulating in the Vessels, or whilst transmitted from one Vessel to the other? and whether hereby it may not be preserved in its entire form, not onely for one, or two, but for many months, yea perhaps years; and whether it will keep its form better in that Glass exposed to the cold, or set in a gentle (as it were an) animal warmth? and lastly, whether that set in heat may not, by continuance of time, be graduated to so high an elixerated Liquor, as that hereby it may be made capable, not onely of preserving it self afterwards from the injury of a separating ferment in the Air, but also may become as a fermental Balsam, able, if given inwardly (or at least outwardly applyed) to preserve the similar Blood it meets with, from all infectious Diseases? yea, it would be worth inquiry, whether it may not make the blood, by his imbred exalted ferment, reject all those impurities contracted by the Scorbute, *Lues Venerea*, Feavers, and other Diseases, even to the performing those cures in the Blood as may probably render it worthy (if any be) of the name of a *Panacea*? which Experiments I think to prosecute e're long, and shall then *(Deo juvante)* give a further account thereof.

The

The eighth Query I thus solve, (*viz.*) That in my Tryals and Observations of Mineral Waters, I allwayes found that no sooner was the Ocre or Sediment precipitated, but they both lose their tinging property with Galls, as also their purging faculty; and that though the Salts which had dissolv'd these *ramenta ferrea*, were left yet dissolv'd in the Water, (after the separation of the Ocre by motion, heat, or air) notwithstanding which, the Waters are found to have no force in their purging Operation; and by how much the more this is precipitated, (even till it be all fallen) by so much the Waters are weaker and weaker in their Operation.

To the ninth, or last Query, I thus answer, (*viz.*) That by what is premised, it must necessarily follow, that the *Phenomenon* of loss of Vertues in such Waters, may by an Hypothesis of an intestine precipitation of their parts wherein those vertues consisted, be much better, and more truly explicated, then by the Hypothesis of an avolation of spirituous parts, through all Vessels and Closures whatsoever.

By this time, these things duly weighed, in the opinion of all judicious Persons, (who ground Science upon the infallible Criterion of Luciferous Experiments) I may well suppose the Spirits in the *Scarbrough* and *Knaresbrough Spaw-Waters*, have no existence; and that notwithstanding what ever *Falopius*, Dr. *Heers*, Dr. *French*, or my Antagonist have said to the contrary.

And hence it is evident why Dr. *French* came to be mistaken, who supposing Volatile Mineral Spirits to be in the *Knaresbrough Spaw-Water*, and indeavouring by distillation (in a Glass-Still, whose Joynts were luted and closed up carefully) to get their

their Spirits, failed not onely in his expectation of catching them, but also found that the first two spoonfuls which were distilled; yea, and the rest undistilled that remained, utterly lost both the taste and odour which they had before; neither would they become any otherwise tinged with Galls, then common Spring-Water: who not easily conscious of his Error, imputes the loss of those Spirits to their subtilty, imagining them so volatile, as to penetrate even the Glass it self, or the Lute, neither of which (he judgeth) could hold them; not recollecting, that no sooner doth heat work upon Mineral Waters, but presently it causeth such an alteration in the texture of their parts, as that forthwith the Mineral Ocre precipitates to the bottom, leaving both what is distilled, and what is undistilled void of tincture, and most-what effæte in vertues, and that not from the avolation of Spirits, but from an intestine precipitation of parts, as is evinced beyond dispute by our former Experiments.

Lastly, These Waters do not only (being hermetically sealed) keep their vertues and tinging qualities, but also are not impaired in their quantity and weight, being found (after six weeks inclosure under the hermetick Seal) neither heavier nor lighter; and now I give room for the World to judge, Whether the authority of my Antagonist be Authentick, and whether or no he hath done well to impose both upon himself and others in the delivery of these words, (*viz.*) That the *Scarbrough Waters* lose all their vertue, yea, their quantity and bulk also, though in Glasses, and under the hermetick Seal, if removed from the Fountain-head, and then they become suddenly putrid,

trid, &c. doubtless through the loss of Volatile Spirits: he speaks this so confidently, as if he had had it from the Oracle of Experience, whereas he never took the pains to make any satisfactory Essayes therein.

From what is premised, may naturally arise these following short Corolaries.

First, That Mineral-Waters operate and give their usual *Phænomena*, by a due contemperature of their Mineral Ingredients.

Secondly, That amongst these, (if especially the Mineral Ocre becomes once precipitated) the Waters lose their purging Vertues and tinging Properties.

Thirdly, So long as these can (either by Nature or Art) be kept from precipitation, so long these Waters retain their proper Vertues.

Fourthly, That to facilitate (or indeed cause) that these Waters should precipitate their Mineral Ocre, is required one of these three, (*viz.*) Motion, Heat, or Air; by Motion, I mean that *ab extra*, for otherwise what Heat and Air perform, is by the medium of Motion; for Heat, or an exposing to the open Air, or a quassation of parts by motion, doth make such an alteration in the texture of these Mineral Waters, as they presently thereby let fall their contained Mineral Earth.

Fifthly, These three being secluded from having any power over them, they (*viz.* the Waters) may continue their Vertues, Weight, tinging Qualities, Colours, and other consequent *Phænomena*, for some months (yea probably for years) unalterd.

Sixthly, That to have recourse to a sort of Spirits (which are not *in rerum naturâ*) for solving those *Phænomena*, better (and perhaps onely) solvable by

by an inteſtine alteration and precipitation of Mineral Ingredients, will argue no leſs then an impoſing upon our imaginations, by a kind of cuſtomary faſcination.

But here I am to advertiſe my Reader, That ſince I committed theſe Papers to the Preſs, I opportunely had ſome diſcourſe with the aforeſaid Dr. *Foot*, concerning his Queries afore-mentioned. Whereupon we mutually agreed, That my Return to the Queries, together with the Experiments, confirming as well as elucidating the ſame, do chiefly relate to the Mineral Medical Waters, which are of that Claſs or ſort, which do purge by Stool moſtly, and alſo by Urine; ſuch are the *Scarbrough-Spaw*, *Barnet* and *Epſham*-Waters, and divers others the like, which are Aluminous, and work by Siedge. But that the *Tunbridge*-Waters, (concerning which he principally propoſed his Queries) and alſo (perhaps) the *Aſtrap*, and *Stallbridge*-Waters, together with all ſuch as work moſtwhat by Urine, ought to have a ſomewhat different conſideration; eſpecially in the point of loſing their Medical Vertues, though they be veſſell'd up with all due and needful circumſtances, and cloſed and ſealed up with all imaginable Art, care, and induſtry; yea, although they are not in the leaſt afterwards moved, heated, or expoſed to the Air; and conſequently, that theſe cloſe Circumſtances, in veſſelling up, and ſtopping in the *Tunbridg*-Waters, and ſuch like, will not prevent this depauperation or amiſſion of their Medical Vertues; as otherwiſe may be done with the *Scarbrough*, and all ſuch like *Spaws*: but as to all the other matters almoſt, both in the Queries, and this Anſwer to them, they ſeem to be applicable indifferently enough to both

the ſorts of the fore-cited Medicinal Waters. Finally, Reader, The Doctor did thank me for my Return to his Queries, though he (frankly) acknowledged to me, he ſuppoſed my Anſwer to be inappoſite only to that point afore-noted, by reaſon of my being (at the writing my Return) a perfect ſtranger to the *Tunbridge*, or any other Waters of the like properties: but further added, That he hoped my Example would be a motive to others, (whoſe abilities and opportunities amply capacitate them thereunto) both from Reaſon and Experiment conjoyntly, to acquaint the World with the knowledge and uſefulneſs of all ſorts of Medical Waters, which Nature hath prepared by her Chymiſtry, or rather the God of Nature hath bountifully beſtowed on Mankind for its relief and comfort.

THE

THE Epilogue, or Concluſion,

BEING

Some Reflections upon the moſt material Paſſages, and conſiderable Experiments, in a late Treatiſe writ by Dr. Tunſtal, *concerning the* Scarbrough-Spaw, *being an Extract thereof, with a return thereto: where a way is propounded for preventing all inconveniencies which may happen to thoſe who drink of the* Scarbrough-Spaw.

BY that time I had finiſhed the fore-going Sheets of this ſecond Piece, I met with a Book written upon the ſame Subject, by an other Chymical Phyſitian; which coming ſo opportunely to my hand, before the concluſion of the whole, I could not let ſlip ſome reflections upon the moſt remarkable paſſages thereof; and that, firſt, becauſe I find him in his *Chymical Analyſis* of this Water, to joyn iſſue with me in the main, by finding out and aſſerting the ſame true eſſential conſtitutive Principles thereof; next, becauſe I perceive him impeaching this *Spaw*-Water of the grand crime of Petrifaction, and thereby of being guilty of cauſing the Stone, Gout, and Jaundice, to perſons inclinable thereto; and for want of due ordering at the *Spaw*, in danger thereof.

As to the first, (he saith) it consists of three Ingredients, (*viz.*) the Nitroaluminous Salt; secondly, the Raments of Stone; and lastly, the Glebe of Alom; all which coincide with what we assert as the Principles thereof, as may be further seen, both in our *Hydrol. Chym.* and in this its Vindication; save that what he calls the Glebe, or blew Clay of Alom, I have described as the Particles of the *Minera* of Iron.

Which difficulty will be easily taken away by solving this Query, (*viz.*) Whether indeed those Particles inclosed in that Alom Glebe, be not Iron, *in succo soluto*, or *in minimis particulis*, Atomes, or at least somewhat equivalent thereto, bearing an analogical proportion of texture of parts to each other; which will not be a little facilitated, if we consider, that as in the Vegetable Family, not only Galls will strike a purple tincture with the Alom Salt (got before the addition of Kelp and Urine) dissolv'd in distilled, or fresh Spring-Water, but also the same may be done by other bodies, whose texture of parts are congeneal; as for example, the inner Bark of the Oak, the Roots of Tormentile, Avens, Bistort, Clove-gillyflowers, and the Flowers called *Balaustia*; all which, like Galls, will strike a purple with Water wherein the Alom Salt is dissolved; yea, and will also become clear again by the instilling a few drops of Oil of Vitriol, and with the Oil of Tartar, will become turbid and muddied, *&c.*

So in like manner, in the Mineral Family, are found several Stones, even in that heap which is fallen off the *Scarbrough* Bank; which would, with Water acidulated with Oil of Sulphur, (as upon trial I found) strike a tincture with Galls, and yet all

all those stony Concretions, which gave the *Phænomenon*, could not precisely be determined to be either Alom Glebe, or Iron Stone, (though both would do it) but were such as consisted of similar parts with both.

The tincture from the Galls in *Scarbrough* Water, he saith, is from unburnt Alom-stone: which suppose we grant, yet I see no reason why my ingenious Friend should conclude, that what is precipitated without the addition of Galls, should not be any thing of Chalybs, or the *Minera* of Iron; notwithstanding his two Reasons, the first of which is, because the Vitrioline Spirit and Iron are too great Friends (being once met together) to be so easily separated; any that hath (saith he) prepared the *Vitriolum Martis* hath learned.

Why? what difficulty is there in their separation? seeing the Ocre, as well in Acid as *Nitro-aluminous Spaws*, doth so easily precipitate, either by being exposed to the Air, (witness the yellow Sediment at the Fountain-head of all such *Spaws*) or by heat, (as for instance) any of these Mineral Waters being heated, boyled, or distilled, will precipitate their hidden Ocre; yea, the Solution of a Vitriol of Iron, or of any common Vitriol will in heat (as I have found by tryal) do the same; or lastly, by motion, *ab extra*, whereby also a precipitation of the same mineral body happens.

His second reason is, When the Vitrioline Water, by passing in the open Air, doth settle its Colcothar at the bottom, without any mixture of Galls, it is always of a yellow colour; which is also answered in my Return to the first Reason: for the Sediment of all *Spaws*, whether Vitrioline from Sowres, or aluminous, are always yellow; witness

both that at *Scarbrough*, and that in *Bransdale*, *Knarsbrough*, and the Spring that runs through an Alom-Work near the *Sulphur-Well* at *Knarsbrough*, &c.

His last Argument against any thing of the *Minera* of Iron in the *Spaw*, is, That whereas in the taking all Chalybeat Medicines, the Excrements are tinged black; but by drinking this Water, he saith, they become blew; to which I answer, That blew, or purple, is black in a remiss degree; towards which difference, the crudity of the *Minera* may probably not a little contribute. But had I now the opportunity of prosecuting one Experiment, I question not but to put the matter beyond dispute; I will now onely propound it, and (as I have leasure) shall afterwards try it, and that is this, (*viz.*) To take a good quantity of the succulent Alom-stone, *&c.* dissolve as much thereof, as will, in a competent quantity of fresh Spring Water, when (for tryal sake) it will tinge with Galls readily; pour it off clear, or filter it, let it stand in open Glasses, or glased earthen Basons, when it hath precipitated what it will of a Sediment, which will be done in two or three dayes time; then pour off the Water gently, and dry it up slowly by the heat of the Sun, and compare that and the yellow Ocre precipitated from Vitrioline Waters together, and that either with a Microscope, or melt them down severally with a blast, to try if the result of both will not be the same.

His proportions of the Ingredients are thus, *viz.* Stone-pouder one ounce three dragms, of *Nitro-aluminous* Salt one ounce six dragms, of the blew Clay, which is (as he supposeth) the Glebe of Alom

Alom three dragms; the active Principles, and the *Caput Mortuum*, are equal.

He Queries hence, from what cause it is, that after you have drunk a month of the Water, then, if not before, it takes a restly fit, will neither go forward or backward; upon which my Antagonist adviseth, *p.* 211. that if the Appetite or Concoction decay, and the Water pass not so well as formerly, but cause distention either in the Belly or Veins, and so bring on a difficulty of breathing, or pain in the Head, or the like, it is then time (he adviseth) to desist and proceed no further.

Is there not therefore, saith Dr. *T.* a sting in the tail of *Scarbrough* Water? Is not the Stone *Feces* plaistered upon the inner coat of the Bowels, disturbing their peristaltick motion, and obstructing the attraction of the lacteal Veins.

His conclusion therefore is, That *Scarbrough*-Water is petrifying; which he endeavours to confirm with four Reasons?

First, By Authority, as that of *Kircher*, *Queritur quid proprie sit succus lapidificus dico, esse saxum introrsum aquâ eliquatum.*

Secondly, By Experiment, in that the *Spaw* is mostly a nitrous Stone, melted in Water, besides the Alom stone imbibed in it.

Thirdly, By the *Apporrheâ Spiritûs Lapidifici*; there are found on the Cliff near the *Spaw*, Muscle-shels, and such like things, petrified.

Fourthly, By the effects the *Spaw* produceth primarily on those inclinable to the Stone; he instanceth himself, and my Antagonist acknowledgeth it, *p.* 150. concerning which the Reader may please to consult what I have said in the *Epilogue* of my

Hydrol. Chym. p. 360, 361, *&c.* which in effect amounts to little less then a concurrence with this ingenious Physitians Observations.

As to the difference betwixt *Scarbrough* and *Knarsbrough Spaws* in this particular of the petrifying property, he urgeth the instance of Mr. *Hen. Procter* of *Fernly*, who was brought very low with a Hectick Feaver, and Asthma, who by drinking of *Knarsbrough* Water, (after a due preparation of his body by Dr. *N.*) coughed up several Stones daily, till he was perfectly cured: the account of which he had from Dr. *N.* By what is premised it appears, that as the one Water layes a stony Foundation for a Fabrick of Sabulous Diseases, to such as take the Water incautiously, and without circumspection of the Nature and Symptoms of their Diseases, by the advice of a judicious Physitian: So the other Water of *Knarsbrough*, being devoyd of all those stony Concretions, and indued with a deopilative, and (if I may so say) antipetrifick property, is more proper for such persons inclinable to such Diseases, unless diligent care be taken, by the advice of the Physitian, to remove, and at due seasons, carry off those sabulous products.

And as the Stone, so the Jaundice, and the Gout (saith he) hath their ἀκμὴ from a petrifying Spirit; he instanceth the Lord *Erwin*'s case, who dyed of the Jaundice, whereby (as he supposeth) the *Scarbrough* Water did petrifie the Sulphur-Saline humour in the *Vesicâ Biliariâ* into Stones, too great to pass through the common *ductus*.

That this Lord did die of the Jaundice, together probably with a complication of some other

Dis-

Diſeaſes, might be true; but that the liquid Balſamick Juyce of the Gaul was petrified, was but only conjectural, although (I confeſs) the conjecture is not irrational, but may give ſome ground of probability, and that becauſe (as he further ſaith) that Stones are as uſually concreted in the Gaul, as in the Kidneys, in Men as well as in Beaſts; whereupon he citeth the Profeſſor at a Phyſick Lecture, in a diſcovery of the Jaundice, who brought forth three or four little Stones of the Gaul, ſeparated from a Gentlewoman (afflicted with that Diſeaſe) by a Doſe of ſharp working Phyſick, by which ſhe was cured: Which he further confirms by the opinion of *Helmont* and *Silvius*, (*viz.*) That the ſecond fermentation made by the *Succus Pancreaticus*, and the Gaul, is as neceſſary for the preſervation of life, as the firſt fermentation in the Stomach; for according to the eucraſy & fluidneſs, or the contrary (I mean obſtructions in the Veſſels) of this balſamick ferment of the Gaul, depends not onely the Regiment of the ſecond digeſtion, and the fluidneſs and obdurateneſs of the Excrements, within the peculiar periſtaltick *conatus* of the Inteſtines, but alſo of all the Diſeaſes thence reſulting, (*viz.*) the *Jaundice*, *Diarrhœas*, *Dyſenteries*, *Cholick*, *Iliack Paſſions*, *Tenaſmus*, *&c.* in as much as, by its *Sulphuro-ſaline* Balſam, it doth not only (in a regular courſe of Nature) become as a ferment to prepare the ſaline milky Juyce, before it be conveighed away by the lacteal Veſſels; but alſo it promotes a ſeparation by a kind of precipitation of the fæculencies of the nutritive Juyce; in which precipitation, the moſt exuberant and untamed ſulphurous parts of the alimentary Juyce, firſt opened and prepared by the ſtomachial ferment, go off in a fætid

fœtid Flatus, peculiar to the Inteſtines, (which is that which *Helmont* otherwiſe calls a Stercorary Ferment) and that it is ſo, appears hence, becauſe the poſterior *flatus* or *crepitus*, will take flame of a Candle, and blaze like an Occidental Meteor; the obſtruction, and conſequently the regurgitation of which *flatus* upon the ſtomach, and other parts, cauſeth many diſturbances of Nature, which now I ſhall not take time to diſcourſe upon.

So that indeed, amongſt the efficient cauſes of the Jaundice, a petrification of part of that Juyce, or a plaiſtering the inteſtines over with a tartarous or ſandy matter, where the *ductus communis* is inſerted, may moſt frequently happen; whereby this *Sulphuro-ſaline* Juyce, deſtined for uſes aforeſaid, may prepoſterouſly be carried (*extra lares proprios*) into the Maſs of Blood, or rather indeed the blood, not undergoing that due ſeparation by the ferment of the Gaul, from cauſes aforeſaid, retains yet in its boſom that which ſhould be ſeparated; which circulating along with it in the habit of the body, vitiates the laſt ferment, or aſſimulative digeſtion, whereby the skin becomes tinged yellow, and ſhines forth in a Saffron colour.

That the Water may ſometimes happen (through the incautiouſneſs of the Patient) to cauſe this Diſeaſe; my ingenious Friend inſtanceth in the caſe of an Alderman of *Newcaſtle*, and a Merchants Wife, who after their return from the *Scarbrough Spaw*, were both afflicted with the Jaundice; as alſo Sir *John Anderſon* and his Lady, who both drinking the Water at home, were afterwards troubled with the Jaundice; all which might indeed very probably happen to thoſe, who without due caution had dranke liberally of the *Scarbrough* Water,

and

and that either at two great a distance from the Fountain, or did not at least use such skilful means, as at due seasons might carry off the gritty fabulous residence of the Water; concerning which ere long we shall prescribe a Remedy.

That the Gout also may be promoted by the *Scarbrough* Water, (arising from a petrifying property of its acid Spirit) he instanceth in himself, who never had the least touch thereof, before he drank that Water; the which also my Antagonist acknowledgeth, *p.* 149. Others (saith he) drinking without due preparation, as was necessary, have fallen into the Gout, the Water contracting heat for want of speedy passage, being thrown by nature upon the weak Joynts, and have hence inferred, that these Waters cause the Gout.

That the drinking of this Water may to some Patients, at some times, occasionally cause the Gout, through the debilitude of the separating Emunctories, carrying the fabulous matter along with the nutritive Juyce, through the Lacteal, into the Venal and Atterial Vessels, in the *liquamen* of the *Latex*, where, in the habit of the body, this fabulous matter may be precipitated into a *tophus*-like, or *nodus*-kind of petrifaction, in the *Synovia* of the Joynts, transmitting along with it a spurious acid Ferment, hostile to those tender parts: I shall not (I say) deny, if we together take into our consideration other concomitant, and perhaps no less essential circumstances, of irregularity in Diet, sharpness and hardness of Drink, in Exercise and perturbations of the Mind, *&c.* which we find often sufficient alone to bring on that Disease, yea, and to exasperate it in a high measure to those who never drank of this or any other *Spaw* Water; yea, and

that

that to many too, upon whose seminal Principles the morbid Character of the Gout was never impressed.

Now I shall proceed first, to examine the reason he gives why the *Scarbrough* Water is not of so petrifying a nature as the *Knaresbrough* dropping Well, (which he supposeth to come from a nitrous Rock) and next I shall prescribe a Remedy how to prevent petrifaction, and also how to carry off what is already contracted; where I shall answer (I hope to the Patients satisfaction) his three Ingredients.

As to the first, the Reason he gives is this, (*viz.*) That the Alkali of the Alom in *Scarbrough* Water, hath in part imbibed the acidity of the Nitre, and therefore it cannot so penetrate the Wood put in it, as to leave a Crust of Stone upon it, which the other Water having (as he saith) Nitre alone, will do; And here I must crave pardon, if for truths sake I dissent from my ingenious Friend; for the groundwork of his reason is laid upon a wrong supposition, (*viz.*) That the Salt of Alom is an *Alkali*, whereas in the current of my whole discourse upon this *Spaw*, I have laid it down as an acid Salt, which are so contrary, as they are never reconciled (upon their mutual contact) till each destroy other, and a third neutral result therefrom. The ground of his Reason, why he reputes Alom to contain an *Alkali*, is from its saponary property. That Alom (saith he) is an *Alkali*, is plain from its saponary property, for the Dyers scour their Cloth from all filth, by boyling it in Alom Water; which is no less then a palpable mistake, for the Dyers use it not for scouring their Cloth, but for laying a ground for other Colours; as for instance, If three pieces of Cloth be put into the Dyers Woad or Glastum,

one

one White, another Yellow, the third Red; the White, without any previous preparation by Alom, ſhall be Blew; the Yellow, by being firſt a few hours in Alom-Water, ſhall be Green; and the Red, by being alſo boyled in Alom-Water, ſhall be Tauny. So that if they ſhould generally uſe Alom Water for ſcouring their Cloth, they would thereby be prevented either of making Yellows or Blacks; to both which, Alom makes Cloth incapable, and therefore they onely uſe it in order to a Ground, fitting it to take other colours afterwards; it wholly deſtroys all Blacks, yea, it is ſo far from being lixivial, as it leaves a harſhneſs upon Cloth, whereby it's made capable of ſtriking other Colours.

Now that Alom conſiſts chiefly of an acid Salt, is further evident by mixing a lixivium of Salt of Tartar, or of any Vegetable fixt Salt, which the Solution of ſimple Alom Salt, the mixture preſently coagulates or curdles into a white Gelly; whereas if it was of the ſame nature, they would mix, as Spirit of Vitriol with Spirit of Vitriol, *Lixivium* with *Lixivium*, Water with Water, like with like.

Beſides, he is incautious of what he elſewhere aſſerts, *viz.* where he ſaith, That the *Scarbrough*-Water curdles Milk, not by any Vitriol, but by Alom; Who Queſtions (ſaith he) that Alom will curdle Milk as well as Vitriol? the more ſubtil any acid Liquor, put to the Milk is, the more perfectly doth it ſeparate the thick parts from the thin; here he acknowledgeth the Alom to conſiſt of an acid Juyce, which is quite contrary to a Lixivial, for what the one makes, the other deſtroys.

Now

Now that the *Alkali* of the Alom should imbibe the acidity of Nitre; this latter assertion is no more true then the former: for as the Alom contains no *Alkali*, so neither the Nitre, as Nitre, any acidity; for if you put a little Nitre into boyled Milk, it will coagulate it no more, then if so much Fossil Salt was put in, neither of which two Salts are acid, until by force of fire in close Vessels; they are brought over in a fluid form, *in statu Fluoris*; in close Vessels, (I said) because in open Vessels, Nitre will by force of fire, with a little addition of Sulphur, or Charcoal, become an *Alkali* or fixt Salt; which is quite contrary to its acid Spirit, got by distillation: yea, that it is not acid, is further evident, in that it will cause no ebullition with a *Lixivium*, which all acids certainly do: So that hence we may certainly conclude, first, That the acidity of Nitre is not a cause of petrifaction; and that's evident, because it hath no acidity, till it be raised by the fire; next, That the cause of petrifaction in the *Scarbrough Spaw*, (compared with *Knarsbrough* dropping Well) is not to be computed from an imbibition of the acidity of Nitre, by the *Alkali* of Alom, neither of which, as such, are *in rerum naturâ*: So that (notwithstanding all this) we are yet to cast about for the finding out a more probable cause of petrifaction. In order to which, I would first inquire, How many sorts of Mineral Waters will coagulate Milk? and amongst them, which are the most likely to contribute to petrifaction?

All Waters therefore which coagulate Milk, are either such as are strongly Vitriolique; witness the *German Spaws*, or such as are aluminous; as for instance, *Scarbrough*, *Epsham*, the *Sulphur-Well* at

at *Knarsbrough*, (which hath an occult aluminous acidity therein contained) *&c.* Or lastly, Such as contain a *Saxum Nitrosum*, or Raments of Stone with a nitrous Juyce, which becomes as a Cement, and knits the fabulous matter (where the place and other circumstances concur) into stony Concretions; of this sort is the dropping or petrifying Well at *Knarsbrough*, also at *Brunston* near *Northallerton*, and in many places more, which will coagulate Milk, and in evaporation leave Raments of a bright nitrous Stone.

Now the subject matter of all stony Concretions, are either a fabulous Earth, glewed together by the efficiency of a salty Liquor, either of Alom, Nitre, Salt Fossil, *&c.* easily coagulable by a spontaneous exiccation of the succulent parts, by being long exposed to the Air, or else it consists in a peculiar petrifying seminal Juyce, implanted in stony Concretions, whereby they have their growth, and increase.

Thus all the Rocks in the Sea, have had their beginning and growth, from a petrifying Seed, which hath transmuted the *Lympha*, or common subject matter of all concrete bodies, into such stony Concretions, *Calx in Mediis Aquis sensim petrescit*: Thus Coral, White and Red, by an innate petrifying Seed, springs out of Rocks, and other Stones in the Sea, which grow from the very same Juyce, the Stone (it vegetates from) had its nourishment; only it is determined into that form, by the imbred plastick power of that stony Plant, and becomes like (if I may so say) a Misletoe of the Rock; Yea, and from one or both causes aforesaid, hath (for ought we know) all the rocky and stony productions in the bowels of the Earth, had their original.

But

But to be ſhort, Petrifaction, as to the *Duelech*, or *Calculus humanus*, (the ſubject we chiefly now have in hand) I ſee no reaſon to the contrary, but look upon it as chiefly ſeminal; elſe how comes it, that little Children are ſometimes grievouſly tormented with fits, and die of the Stone; As I have ſeen a young Child, after death, opened, whoſe Reins contained one large Stones, beſides divers other leſſer ones; by which it ſhould appear, that the *inclinatio petrifica*, which is the ſame with a petrifying Seed, was at firſt impreſſed upon the Seminals of its conſtitution; and in ſuch, where the petrifying Seed is at work, the nutritive Juyce can never be ſo pure, nor the Steinors or Colanders of the Veſſels be ſo accurate in their functions, but the Stone and Gravel will be increaſed, the Spirit of Urine will coagulate it ſelf upon its innate Earth, and ſo cauſe a concretion of a fabulous matter; although much more from ſome ſorts of Meats and Drinks, then from others; amongſt ordinary Drinks, Ale that is hard, blenk'd, or new, thick and unwrought, or Wine which is not depurated from its Tartar by due fermentation, are very prejudicial fomenters of the Stone; ſo is Bread not well baked, Meat not well cooked and prepared; and in fine, what ever contributes to the Fabrick of the nutritive Juyce, when through the weakneſs or error of the ferments, reluctancy of that which is taken, or injuſtice of the diſtributive powers, a feculent tartarous or fabulous matter is ſequeſtred, and either thrown upon the Veſſels, or tranſmitted by the current of the *Latex*, into other more fine Collanders and Streinors of the Body.

Then the *Stone*, *Gout*, *Jaundice*, *Diarrhœa*, *Dyſenteries*, *Feavers*, *&c.* are in time brought forth, eſpecially

especially to such persons whose constitutions, or peculiar fabrick of their constituent parts (whether Liquid in Vessels, or Solids) are most inclinable, and consequently most susceptable of such Diseases.

Therefore respect must primarily be had to the *inclinatio petrifica & podagrica*, or natural inclination to the Stone or Gout; for to such, not only the Waters which contain a fabulous matter, but also the common nutritive Juyce made from our ordinary food, may singly or conjoyntly bring forth, or else exasperate the fits of the Stone, Gout, *&c.* for the fabulous matter of the Waters, as well as the tartarous recrements of our food, being imbibed by the *Latex* of the Blood, doth (the one as well as the other) by its various filtratures and percolations, leave its precipitate upon the Streinors, Bowels, and Membranous Parts, causing the foresaid Discases in Bodies inclinable thereunto.

Now in what my Antagonist glorieth, this our Author and Friend accounts no less then the shame of the *Scarbrough* Water, (*viz.*) That it contains such a large quantity of the Minerals (as he calls them) including together with the noble Salt, also the dirty fæces and stony matter, which without doubt (if any thing) is its greatest disparagement: But here, as we shall accuse the one of vanity, and to have done it, not for want of ignorance in the critical Analysis of that Water; So the other we shall no less impeach of too tart a reflection upon the same, and of raising a theoretick Fabrick from too sandy a foundation.

But before we prescribe our Remedy to prevent petrifaction, *&c.* I shall first bring the matter in controversie to the test, by propounding onely this

lowing Experiment, which I have not yet, but may (God willing) take the opportunity of trying at this *Spaw*-time, which will certainly answer this querie, *viz.* whether the *Scarborow* water doth leave any considerable quantity of its fabulous matter in the body, whereby it may give just cause of suspition of furthering or increasing the Stone, Gout, Jaundice, *&c.* the Experiment is this, *viz.* To save the Urin of a calculous, gouty, or other such like Patient, after he hath drank plentifully of the *Spaw*, which is onely to be saved after the Urin comes untinged from him, to the quantity of two or three quarts, and to distil that in a Glass Body or Retort, or barely to evaporate it in a Jar Glass, and so to try whether indeed it hath or no, left any considerable quantity of its fabulous matter in the body; which may truly be computed from the more or less quantity of the stony matter left behind after evaporation or distillation, compared with the residence of the same quantity of the *Spaw* Water, distilled or evaporated fresh from the Fountain.

A Method Prescribed

For the right use of the

Scarbrough-Water.

NOW come I to give my Receipt how to prevent petrifaction, by propounding a Method for the right use and improvement of the Water; where, first, I advise all Patients, who would take this Water for their best advantage and help, for the prevention or cure of the *Stone*, *Gout*, *Scurvy*, *Jaundice*, *Palsies*, *Epilepsies*, *Asthma*, or other chronical Diseases; to begin with a gentle Vitrioline Vomit, the Dose to be ordered according to the discretion of the advising Physitian, which may be done, although the Patient hath for some time drunk of the Water; for this sort of Vomit (which is surely the safest in the World) doth not onely carry off plenty of a depraved matter, involved in the Tunicles of the Stomach, the fomenter of most Diseases, whether Acute or Chronical, but also strengthens the Fibres of the Stomach, and other Membranes, through the whole body, reducing them to their proper Tone; which the generality of Solutions, yea, the too frequent use of this *Spaw* Water, is apt to relax, and to make them flag and hang; the depravation of whose œconomy, makes them forgetful of their offices, and renders them susceptible of a stony in-

cruſtation, from the ſabulum of the Water; and hereby they become the cauſe of all thoſe Diſeaſes, which happen upon thoſe who incautiouſly drink, and that long and plentifully of this *Spaw* Water: and hence it is, that after a months drinking of the Water, it ſometimes happens that the Appetite or Concoction decayes, (which my Antagoniſt acknowledgeth) or the Waters paſs not ſo well, but cauſe diſtention in the Belly or Veins, and ſo brings on a difficulty of breathing, pain in the head, &c.

All which may be now remedyed, by the method we are now propounding; for this kind of Vomit (which may, as occaſion ſhall require, be ſafely repeated) doth fortifie the membranous parts notably, and makes them mindful of their duties; after which the Patient may, for two or three mornings, drink pretty freely of the Waters, uſing moderate exerciſe after, as walking upon the Sands, or in their Chamber; and about two hours after the laſt Glaſs of Water, let them drink a Glaſs or two of the beſt White Wine, (well refined from its Tartar) and about one hour after that, take ſome warm Broth; then to eat of a few Diſhes of Meat, and thoſe to be as well ordered as may be: nor is it a little reſpect that is to be had to the Drink at Meats, viz. that it neither be new, thick, or unwrought, nor that it be hard or tart.

So that four things are to be regarded in the drinking of the Waters.

Firſt, Moderate exerciſe after drinking the Water.

Secondly, To drink a Glaſs or two of Wine, two hours after the Water, to help the paſſage thereof.

Thirdly,

Thirdly, Not to eat too ſoon after the Waters; for either by too immoderat exerciſe, that which ſhould paſs away by Urine, (by the ſhort way) is prepoſterouſly carried into the habit of the body, or by eating too ſuddenly before the Waters have paſſed; the like diſorder may happen, (viz.) That the Latax wherein the ſabulous matter is diſſolved, is thereby in danger to be carried by the Thoracical Veſſels, into the fourth digeſtion of the heart, and thence into the habit of the body, where it may lay a foundation for the Gout, Stone, Scurvy, Feavers, *&c.*

Fourthly, A moderation in Dyet, having good Meat well ordered, and to keep a reſtraint upon the Stomach, not overcharging it with too much, nor with too great variety of food, for ſometimes what the Water builds, in order to health, the irregularity of dyet in ſome perſons pulls down.

Fifthly, Good wholſome Drink is to be choſen at Meats, which ſhould neither be very ſmall, nor hard or tart, nor, laſtly, new, thick, or unwrought, but ſhould be ſoft, clear, and healing Ale; or a middle ſort of Beer, freſh and lively; all botled Ale (eſpecially that which flies) is to be avoided; in ſhort, it ſhould be kindly Ale, ſuch as may well dilute our other ſolid Food, and be a ſutable Vehicle of our nutritive Juyce; for from a due contemperature of our Drink and Meat (by the efficiency of the ferments) ariſeth the wholſomneſs of our nouriſhment.

When the Patient hath drank for two or three dayes of the *Spaw* Water, after the former directions, then is he to take a Doſe of Solutive Pills, *viz.* one over-night, and two the next morning; obſer-

ving much what the former inſtructions, and to omit taking any Water for that day.

Theſe Pills ought to be ſo contrived by the Phyſitian, as to contain in them ſuch Ingredients as may chiefly reſpect the Scurvy, and that becauſe the Scurvy is moſt-what the ground to other Diſeaſes; and next, that they may be ſuch as may give the Patient four or five ſtools, (without griping) as his ſtrength, and the indications of his Diſeaſe may require; not neglecting, in the interim, other ſpecificks ſeaſonably to be exhibited, as the Phyſitian ſhall think meet, from the indications of the Diſeaſe.

Then (if the Phyſitian think fit) is the Patient to reſt a day or two from taking the *Spaw*-Water, and that to prevent a ſudden precipitation of the ſtony matter upon the Tunicles of the Inteſtines, after their abſterſion or cleanſing by the former Solutive; and after that to begin again, obſerving the former inſtructions, and ſo on in a round, with ſuch diverſifications as the Phyſitian, from a critical obſervation of the Symptoms and Indications, ſhall judge requiſite, until the Patient be cured, at leaſt in ſo hopeful a way towards it, as that Nature may, without much ſtreſs, tug through the reſt.

And by this means, will all the inconveniencies which happen, as afore-ſaid, to incautious *Spaw*-Drinkers, be prevented; hereby Patients will not miſs of their aim, *viz.* their deſired health, *&c.* This courſe being taken, I ſee no cauſe of ſuſpition of any harm from the Waters; for ſuppoſing (at the worſt) a precipitation ſhould happen, which cannot be much; the next Doſe of Antiſcorbutick Pills, together with a good Diuretick, and a glaſs or

two

two of Wine, will absterge it off, and carry it cleverly away.

Nor need we be altogether so fearful of harm from the stony Concretions in the Water, if we consider, That Physicians often prescribe Coral, Crabs-eyes, Pearl, Crabs-claws, Hyacinth, Smaragde, Saphire, Bezoar, *&c.* which are the Ingredients of several compound Species, as of *Pulv. è chel. cancrorum, species Cordiales, &c.* frequently ordered by them for the cure of Diseases; which sometimes dulcifie the Blood, and other essential Juyces of the body, by coagulating their acidities, which otherwise cause obstructions in the bowels, and give beginning to Apostemations, *&c.* being frequently carried off by Siedge.

Yea, I know a Gentlewoman, who being troubled with a spurious (and therefore superfluous) acidity upon her Stomach, amongst the hundred of Remedies she hath used, finds nothing comparable to the eating plenty of Chalk, which is a stony Concretion: This more powerfully, then any other thing she has yet met with, dints the overflowing acidity, sweetens it, which otherwise, with an acid *flatus*, afflicts her Intestines, causing unusual *tormina*, or griping of the Guts; Of this she has eaten (as I remember she told me) some pecks in some late years, and yet is no more afflicted with the Stone or Gout, then she was before the taking thereof.

So that all those who are not originally inclined to the Stone or Gout, may very safely drink of the Waters, and that with very good success, for the cure of most other infirmities, by the due management of the *Spaw*, according to our prescribed Method, where we are not so magisterial in our advices, but do leave the judicious Physitian to vary, as

he seeth cause, I giving only hints, and opening a Casement for more light, for the better discovery of the improvement of this Noble *Spaw*, in order to the cure of many Diseases; for Art is not only to imitate Nature, but also help and supply its deficiencies, separating what is superfluous, and adding what is necessary.

But if any, who are inclined originally to the Stone or Gout, shall upon the consideration that the *Scarbrough*-Water is so esurine or acid, by its imbibed Nitro-aluminous, or duplicate Salt, as to dissolve and carry along in its bowels the several Raiments of Stone, shall, I say, thereupon become jealous of drinking the Water:

To those I shall first advise, the drinking the Water according to our prescribed Method; which if it do not answer their expectation upon tryal, at least doth not satisfie, then would I thus farther add, *viz.* That doubtless when these stony Concretions are separated by Art or Nature, the foresaid Salt being dissolved in fresh Water, (which upon evaporation yeelds no sabulous Sediment) must needs, I say, become very powerful against all those Diseases, whose seminaries consist in a sabulous petrifying property, as the Stone, Gout, Jaundice, *&c.* especially if dissolved with the addition of Salt of Steel, and drunk with great plenty of Spring-Water so acuated.

And therefore, lastly, would I propound to all those who are afflicted with these Diseases, upon not being satsfied with the former Method, or being at too great a distance, to take it accordingly, either (by procuring this duplicate Salt of the *Spaw*) to dissolve it in some pure Spring Water, as aforesaid, with the addition of Salt of Steel, and so to drink

it

it (according to the advise of their Physitians) at home; or else, to dissolve the same Salt in some Vitrioline Water, as that of *Knaresbrough*, *Rotheram*, *Olton*, *&c.* and to drink as large quantities thereof, as their Physitian, by the indications of their Diseases, shall advise.

Thus, from what is premised, the three Indications (propounded by my candid Friend) for the right improvement of the Water, are readily, and without much ado, answered: for, first, by a right management of the Waters, according to our Method, the suspitious petrifying property of the *Scarbrough* Waters may very probably be prevented, yea and though already begun, may as likely be carried off; And, secondly, by the same process, the Stone-pouder, and fæces of the Alom, may be hindred from fixing upon the Bowels; and, lastly, to prevent (in tender constitutions) that the duplicated Salt corrode not the Entrals, may easily be done, either by our former Method, or by diluting the essential Salt thereof in great plenty of fresh Spring Water, or by dissolving it in Vitrioline *Spaws*, as aforesaid.

An APPENDIX

Concerning the Anatomy of the *GERMAN* Spaw-Water.

I Took about a quart of the *Spaw-Water*, (which is brought out of *Germany*, and exposed to sale in *Leiden*, *Amsterdam*, and other Cities of the *Low-Countries*, in Bottles sealed up) into a little of which I put some Pouder of Galls, with which it struck a pale Clarret colour; the rest I ordered to be put into a Glass Retort, with a clean Receiver close luted to it, and gave an easie heat, distilling off first about one ounce of Water, then poured it forth, and found that it had neither taste, smell, nor any other properties that might distinguish it from ordinary Spring-Water distilled; for with Galls it would make no more alteration then common distilled Water: Then we distilled off about two or three ounces more of insipid Water; after which, I ordered the fire to be permitted to extinguish, to try what kind of precipitate it would let fall; because, after the first ounce was come over, slacking the fire, we found that a little Sediment was fallen, which was of a pale reddish colour; and upon the second cooling, more of the same fell down: Then I caused that which remained in the Retort to be filtred, and sav'd the Sediment in the Filter Paper; which being dryed up, was an insipid pale red Calx.

Then

Then I tryed if the filtred Water, after this precipitation, would give any tincture with Galls, as it did before ſeparation, but found it would not; after which I poured it into the clean waſhed Retort, and diſtilled again, as before, until all was come off, except about one half ounce: This I brought to *London*, and evaporated in a clean Jar Glaſs, in a gentle heat, till it came to a dryneſs. The colour of this Pouder was ſomewhat white, and its taſte was pleaſantly ſharp or piercing, with a heat and warmth diffuſed upon the Tongue, but had no Vitrioline taſte: to this, pouring Oil of Sulphur *per campanam*, it did make a manifeſt ebullition, as if it had been poured upon ſo much Salt of Tartar; but Oil of Tartar *per deliquium*, did cauſe no effervescence at all; by which it was evident, that the Salt contained in this reſidence, was rather lixivial then acid, although in taſte it ſeem'd to be neutral, but to partake of both; ſo that probably this Spring in its Original (I mean where it is firſt impregnated with Mineral Juyces) is hot, but running further through a Colander of Earth or Sand, loſeth its heat, and becomes at its eruption a cold Spring.

Obſer-

Observations on the dissection of a Woman who dyed of the Jaundice.

AND here, that I may entertain the Reader with some little variety, I shall end all with some Observations on the dissection of an antient Woman, who dyed at the Hospital in *Leyden*, of the Yellow Jaundice; Her Skin (before death, as well as after) was dyed the most deep Yellow that ever I saw in my life; she consumed away in a *Marasmus*, notwithstanding all the means that could be used, and it will be judged impossible that it should otherwise be, after I have related what we observed in the dissection of her body: Upon the opening of the *Abdomen* of this *Cadaver*, (perform'd by the Professor in the Theatre) was first observ'd (omitting the less considerable enormities) a connexure or knitting together of the *Pylorus*, and the under part of the left Lobe of the Liver, close by the *Vesica Bilaris*, by a hard schirrhous tumour; for besides that, the Stomach was somewhat larger then ordinary, and the Spleen lay length-wayes, in a parallel line with the direct Muscles of the *Abdomen*, being somewhat less then usual; and although being cut, its *Parenchyma* was found of a due consistence, and not vitiated in substance; I say, besides these, the Liver was found very stiff and hard, with several schirrous tumours, some lesser, some bigger, whose consistence was most-what glandulous, one or two being as big as Wall-nuts, and some less, but one near as large as a Man's Fist.

The

The *Cystis Fellea* was large and very hard, which was found (together with those in the *Ductus*) near a hundred and twenty Stones, some like little Peas, some larger, but all of them most-what angular; in colour some near bright, and not much unlike the ordinary sort of Mother of Pearl; others had dark spots intermingled, and, as it were, marbled: The Professor distributed to each of the Students, who were present, one of these Stones as a rarity. The liquid part of the Gaul, which was not yet petrified, most of which was lodged in the *Ductus Hepaticus*, was tenacious, and most-what of the consistence of a Syrup.

The common *Ductus*, which reacheth from the *Cystis* to the *Duodenum*, was so much obstructed, as the Professor could not (without cutting the Vessel which leads from the *Cystis* further open) make the Style pass from that part into the Intestine; and that because the situation of the parts was altered, and become different from the natural, by reason of that strict connection of the *Pylorus* with the Liver.

Then opening the *Thorax*, the Lungs were found scarce vitiated at all, but the Heart was less by much then usual; yea, and that which was the wonder of the whole, (and which no Author (that we know of) has yet ever observed) was, to see a *Schirrus* upon the right Ventricle of the Heart. True, the *Polypus Cordis* has been frequently found in the dissection of *Dutch* Bodies, by the fam'd *Sylvius*.

And I saw another Woman dissected there, who dyed (as was supposed) of a *Syncope*; in the right Ventricle of whose heart was found a *Polypus*, several inches long, from the Basis to the Cone thereof;

of; although it's more probable ſhe dyed of a complication of other Diſeaſes; for in the *Abdomen* was found a great quantity of a *Serum*, together with plenty of a *Pituita* floating together in that cavity. But that there ſhould be a ſchirrous tumor upon the Heart, is what we never heard of, or at leaſt never obſerved before.

As to the cauſe of the Jaundice in this Woman, it was variouſly diſputed; ſome ſuppoſed that it proceeded onely from an obſtruction of the Bile, which thereby being mixed with the Blood, was diſperſed into the whole habit of the Body: Others ſuppoſed that the Diſeaſe proceeded from a volatility of the Bile, which paſſing up by the *Ductus Hepaticus*, was thence, by the *Vena Porta*, ſent into the Maſs of Blood, and ſo vitiated the whole habit of the Body with that Saffron Dye: But upon the diſſection, it ſhould ſeem to be evident that the natural Craſis of the Bile was wholly perverted, and that that which ſhould have been uſeful in its due conſiſtence, not only as a Balſam to the Blood, but alſo by its volatile *Alkali*, to perform the gentle and natural fermentation in the Inteſtines, together with the ſubacid ferment of the Pancreatical Juyce, was in great part (being vitiated in its conſtituent parts) petrified; which petrifaction, as well in that as in other parts of the body, do all, moſt probably, proceed from the ſame efficient cauſes; and that (not unlikely) from a too great exaltation of the ſaline and ſulphureous parts of the Bile, coagulating themſelves upon ſome terreſtrial or tartarous matter, which, by continuance of time, hath been precipitated to the bottom or ſides of the *Veſica Bilis*.

From

From what is premiſed, I would excite the Ingenious to further improvements, that we may the better be capacitated to do good by a right underſtanding of the cauſes of things; and that by propounding, firſt, that ſeveral Experiments may be eſſayed, in order to the immitation of theſe Anomolous Products in Animals, which do ſo often afflict the humane Body, in ſeveral parts thereof; for from a true apprehenſion of the eſſential Cauſes which concur in the Fabrick of theſe Animal Stony Concretions, we may the better be informed, how to prepare ſuch *Menſtruums*, as may genuinely (and without corroſion of other tender adjacent parts) reſolve ſuch petrified Bodies.

FINIS.